ELECTRICAL REVIEW

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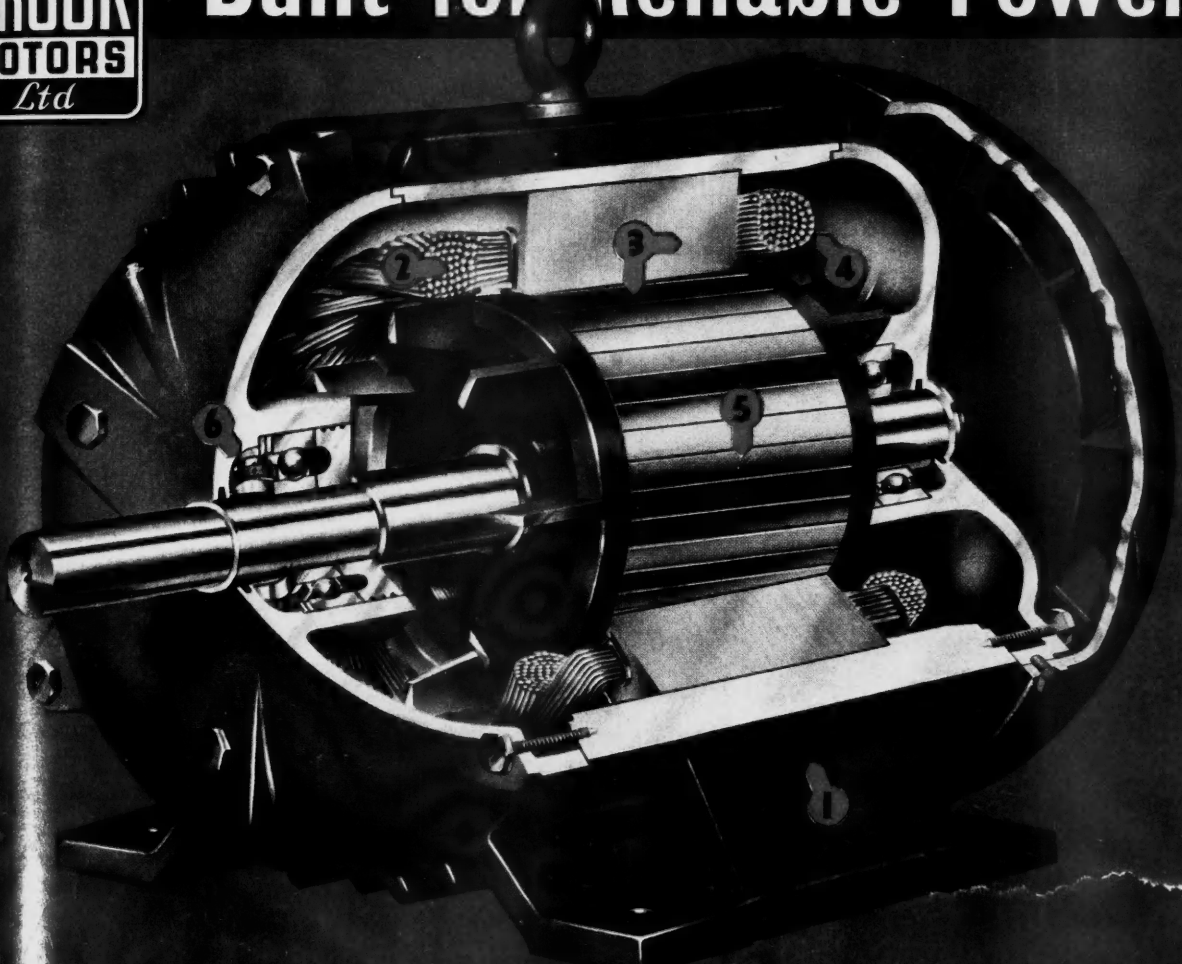

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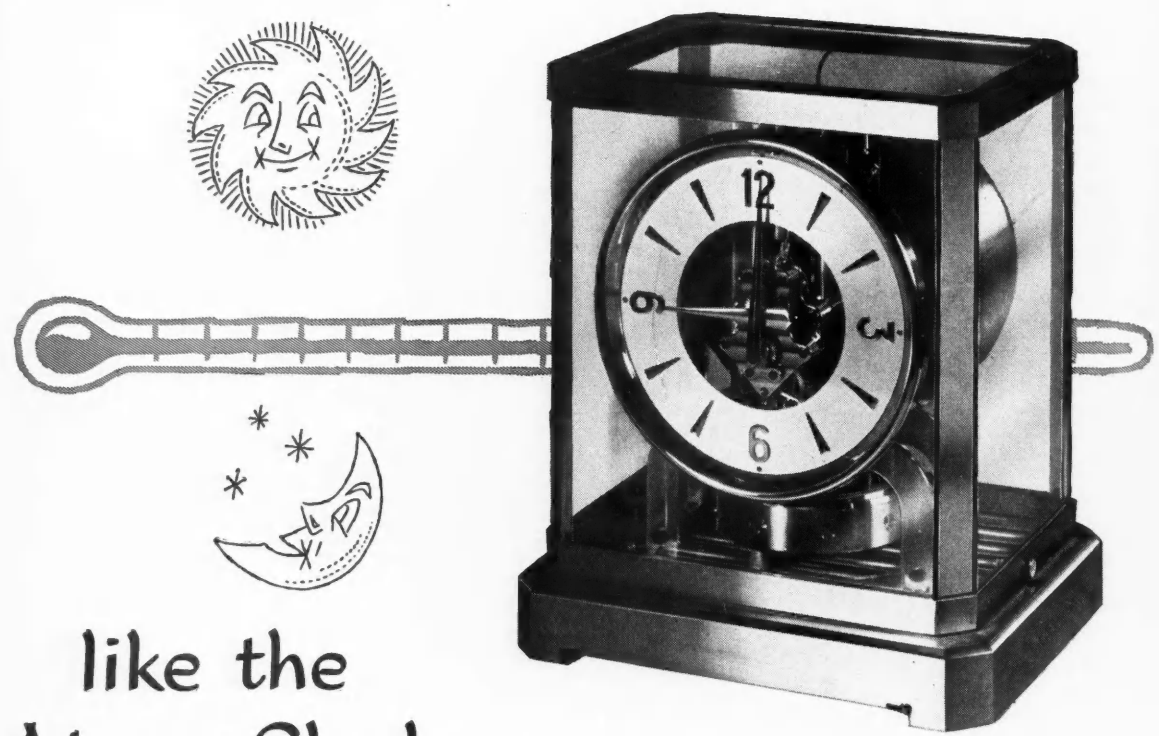

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ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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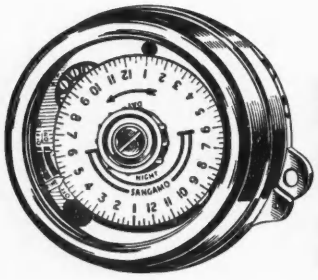

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ELECTRICAL REVIEW

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What is "Public Interest"?

THE Report of the Monopolies and Restrictive Practices Commission on the Supply and Exports of Electrical and Allied Machinery and Plant is an extremely complicated document, but the general impression that it gives is one of condemnation of the manufacturers whose activities were investigated. Throughout the report runs the implication that those activities have been against the public interest and naturally this has been the theme of the headlines in the lay Press.

It is conceivable that some practices, although once necessary, may now have become superfluous, but we may question whether in the ultimate result those practices have really been against the public interest. But that must depend on the interpretation of the term and it is in this respect that the " investigated " manufacturers may be justified in characterising the Report as " doctrinaire."

Broadly the plant covered by the inquiry is classified in two ways. First as regards size: the largest items of plant are purchased by extremely few users. Secondly, whether it is for the home or export markets. It is implied that there has been a tussle between the Central Electricity Authority and the manufacturers since 1948 and according to the Commission this does not appear to have resulted so far in a victory for either side. It is evident to us, however, that the exchanges have been on the normal buyer-seller basis. The Commission does not expect that continuation of the common price system would give either party a permanent advantage over the other although it does not believe that the abolition of the system would tip the balance decisively against the manufacturers. Nevertheless it considers that common prices are against the public interest. The evidence from other buyers in the home market does not seem to be conclusive in either direction, for price and quality are factors which do not lend themselves to simple sorting out.

When the Commission studies export trade the position is still more obscure. Instances of complaint appear to have been very few. The manufacturers concerned in the inquiry claim that collective action has maintained exports at a higher level than would have been the case with price competition between them. Here the Commission merely says that it knows of no evidence to show whether " collective judgment " is right or wrong, but, surely, the position attained by the industry in export trade might be regarded as proving the success of the policy. Here, again, the Commission considers that the public interest is adversely affected, but it is not surprising that one

member, Mr. C. E. Wrangham, is unconvinced; the wonder is how the majority came to their conclusions.

We will not for a moment maintain that the manufacturers have always acted in the public interest, but lack of definition of the term makes it difficult (or impossible) for anybody to judge. The Trade Groups concerned have recognised that there may be anxiety about their agreements and have offered to justify them to an "acceptable independent authority." But, setting its face against any kind of common price system, the Commission has rejected the proposals. The manufacturers are so convinced that their practices are actually in the national interest that they welcome the opportunity of proving their case before the Restrictive Practices Court "where the facts will be given their due weight."

ELECTRICITY CHARGES IN EUROPE

At a moment when our legislators are busy, for the third time in ten years, in changing the structure of the electricity industry, it is interesting to compare the United Kingdom administration with those of other Western European countries. A report published by the Organisation for European Economic Co-operation, which was reviewed last week, shows how the generation and distribution undertakings of thirteen member countries are split up as between public and private bodies. It is noteworthy that of the six largest countries, in terms of electricity output, two have wholly nationalised administrations, one has predominantly private enterprise, while the other three are roughly half-and-half.

The degree of governmental control exercised over electricity rates varies considerably, and by no means corresponds to the line of cleavage between public and private ownership. In most cases rates have to be submitted for approval to authorities who have power to fix maximum prices for lighting and motive power. Sometimes control goes farther than this; thus in Italy the rates are governed by an inter-ministerial committee, and undertakings have to apply the rules which it lays down. In spite of the wide diversity disclosed by the report, it is evident that the countries of Western Europe have all had very much the same administration problems to solve and their different solutions show a large measure of similarity.

NUCLEAR ENERGY AND EFFICIENCY

From the time when it was first announced that nuclear energy would be used as the source of power for the generation of electricity until the presentation of the symposium of papers on the Calder Hall nuclear energy power station in November last, very little, if anything, was heard about the probable thermal efficiencies of the stations to operate on the new power source. Many generation engineers who have regarded the improvement of thermal efficiency as their main object in life have been troubled about this, but that there will eventually be sound bases for calculating efficiency was brought out in the symposium.

Opening a recent conference at the Atomic Energy Research Establishment, Harwell, Sir John Cockcroft, director of the Establishment, said:— "The objectives of the Authority's research and development programme in nuclear power may conveniently be discussed in relation to the three stages of the large power station programme with some additional reference to other reactor uses. For the first stage our objectives are to advance the technology of gas-cooled reactors so that temperatures can be raised by at least a hundred degrees Centigrade, thereby enabling ratings and efficiencies to be increased and capital costs per kilowatt lowered towards the cost of conventional stations."

GLASS INSULATION

In a paper "The Development and Use of Glass Fibres" by Mr. A. Hudson Davies, O.B.E., M.A., recently presented to the Royal Society of Arts, the author draws attention to the importance of glass to the electrical industry. He says for example: "Fine glass yarns still find their most important outlets in the electrical industry. Nowadays they represent about thirty per cent of glass yarn disposals. For electrical purposes a special glass has to be used with an alkali content of less than one per cent instead of the normal 15 per cent of a soda lime glass, because we must be sure that if moisture gets into the insulation of a motor or transformer it cannot leach soda out of the glass and so become a conducting electrolyte and cause the insulation to break down."

The important point about glass fibre electrically is its dual insulating properties—for both heat and electricity. It seems then that glass is likely to have a growing importance to the electrical industry. All the same it would be wrong to assume that glass fibre will have all its own way in this field, for all sorts of materials are being introduced because of their combination of both heat and electrical insulation properties. Up-to-date evidence of this is to be found in the spate of motors with class E insulation which are being introduced to permit higher operating temperatures and consequent smaller motor dimensions.

FIRE AND EXPLOSION RISKS

Elsewhere in this issue (page 392) we summarise the proceedings during 1955-1956 of the Committee on Industrial Fires and Explosions. The function of the Committee is to consider the industrial hazards which arise from certain dusts, vapours and gases, and to advise the Director of Fire Research on the securing of information to enable industry to avoid or reduce the effects of these risks. Experimental work in this field is being carried out at the Fire Research Station at Boreham Wood, and at the Safety in Mines Research Establishment at Buxton.

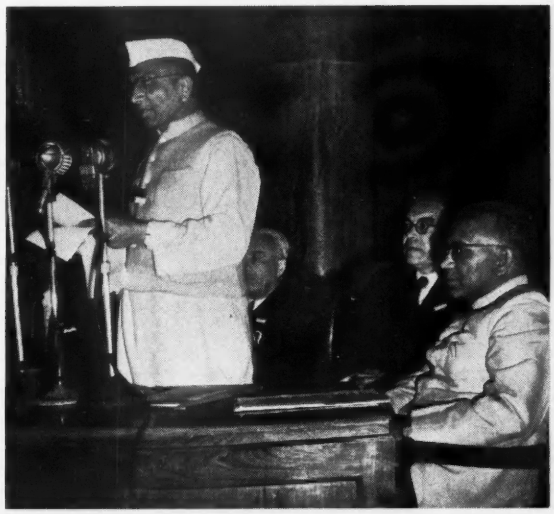
Because of the great amount of research and development which had to be carried out by the electrical industry before it could win its way into the various fields indicated, which have in more recent years become greatly extended, from coal mines to oil refineries, chemical works and numerous types of grinding mills, we feel that the electrical industry has at least as much to offer in the way of advice to the Committee as any other industry. The Committee has asked research associations and similar bodies for comments on the fire and explosion problems of their industries, and we feel sure that the request will not be in vain so far as the electrical industry is concerned.

Commonwealth Standards

Proceedings at the New Delhi Conference

By A SPECIAL CORRESPONDENT

THE Conference of representatives of the national standards organisations in the Commonwealth countries, which took place in New Delhi from 21st January to 3rd February, was the third such Conference to be held since the war. The main purpose of the General Sessions is to enable the executive officers of the standards organisations to discuss matters of policy and procedure relating to co-operation in the formulation and alignment of standards and in the administration of certification schemes, while the Technical Sessions discuss problems in connection with standards for specific classes of equipment or materials. At the Delhi Conference there were four Technical Sessions devoted to electric cables, electrical equipment of machine tools, safety requirements for domestic electrical appliances, and steel respectively. The technical side of the Conference was therefore predominantly of electrical interest, but this was a fortuitous circumstance and at future Conferences other matters will be discussed. It is probable, for instance, that amongst the subjects to be dealt with at the next Conference (for which no date has yet been fixed) will be cranes and air receivers.



Shri Morarji Desai, president of the Indian Standards Institution and Minister for Commerce and Industries, declares the Commonwealth Standards Conference open. The inaugural ceremony took place in the Central Hall of Parliament House, New Delhi. On the extreme right is Dr. Lal C. Verman (director, I.S.I.) and next to him is Mr. H. A. R. Binney, C.B. (director, B.S.I.). Sitting behind the president is the High Commissioner of Pakistan. Also on the platform were Mr. A. L. Stewart (director, Standards Association of Australia) and Mr. J. S. Cameron (president, Canadian Standards Association)

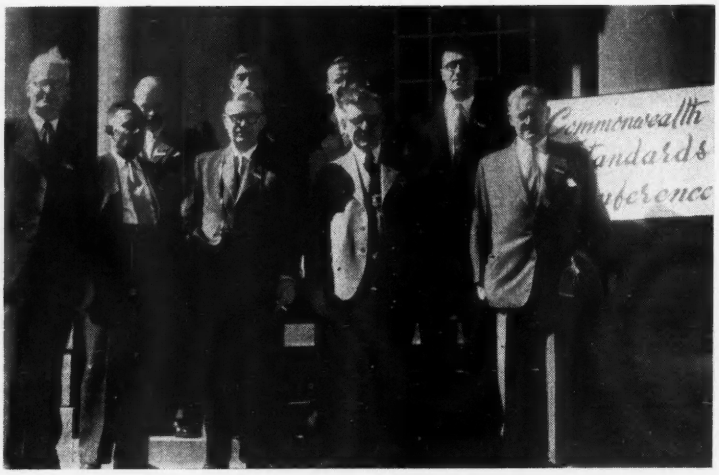
The Delhi Conference was organised by the Indian Standards Institution, though much of the preparatory "paper work" had been done by the British Standards Institution which had acted as secretariat and host for the two previous conferences (in 1946 and 1951 respectively). It was attended by delegates from the B.S.I., the Canadian Standards Association, the Indian Standards Institution, the Pakistan Standards Institution, the Standards Association of Australia, and the New Zealand Standards Institute, and an observer was present on behalf of the Economic Commission for Asia and the Far East. Unfortunately, no delegate from the South African Bureau of Standards was present, but the Bureau had an observer at the meetings of the technical session on cables. The largest delegation was, not unnaturally, the Indian (comprising about 80 members) and the next largest was that from the United Kingdom (25 members).

The opening meeting took place in the beautiful Parliament House on 21st January, when the delegates were welcomed by Shri Morarji Desai, Minister for Commerce and Industries, who was acting in his capacity of president of the I.S.I. In his speech he said that India, which had a tradition of the inch-pound system and was changing over to the metric system, had a special responsibility of finding a common meeting ground. He emphasised that there was no idea of regimentation of standards within the Commonwealth, and the national standards bodies were free to adopt measures suited to the needs of their countries. It was in their interests, however, to bring their standards into line as far as possible.

Short speeches followed by the leaders of the various delegations, and Mr. H. A. R. Binney, C.B., director of the B.S.I., acting on behalf of all delegations, presented an illuminated address to the I.S.I. congratulating that body on the celebration of its tenth anniversary.

GENERAL SESSION

The General Session sat for six days, under the chairmanship of Dr. Lal C. Verman, director of the I.S.I. The United Kingdom was represented by Mr. H. A. R. Binney, who also acted as vice-chairman. Items on the agenda covered a review of the recommendations of the 1951 Conference on matters of policy and procedure, together with a number of new subjects, including the decision of the Government of India to adopt the metric system and the question of how this will be implemented in the drafting of Indian Standards. Few active steps have so far been made in this direction, and it is clear that the I.S.I. will welcome direct Commonwealth consultations and, later, consultations through the I.E.C. and I.S.O. The discussions at the Delhi Conference undoubtedly helped towards a clearer understanding of the problem, and consultations will, it is expected, take place in connection with specific standards, each being discussed on its merits with a view to exploring how the Indian Standards can be based on the metric system without unnecessary divergence from the standards in the



The United Kingdom delegation attending the sessions on electric cables. Front row (left to right): Mr. J. F. Stanley (B.S.I.); an Indian delegate; Mr. G. N. Green (Eastern Electricity Board); Mr. P. W. Cave (British Insulated Callender's Cables); Dr. H. A. Tunstall (Henley's). Back row (left to right): Mr. G. E. Heard (C.M.A.); Mr. S. J. Kermick (Sterling Cables); Mr. G. Yates (observer from South Africa); and Mr. G. A. Bowie (Crompton Parkinson)

inch-pound system to which other countries are working, thus making it possible for India to buy from either inch or metric countries.

Arising out of the discussions on matters of policy, it was agreed that when a Commonwealth standards organisation could not be directly represented at an I.S.O. or I.E.C. meeting, it might request another Commonwealth standards organisation to put forward its point of view.

ELECTRIC CABLES

The discussions on standards for electric cables were a continuation of the discussions that took place on the initiative of the B.S.I., at a Conference in London in 1953, and the purpose of the Delhi meeting was to review the progress made in the Commonwealth countries towards implementing the recommendations made at the 1953 Conference and to consider whether, in the light of developments since that date, any of the recommendations then made should be amended.

The Cables session took place on 22nd-25th January, the chair being taken on the first two days by Shri Venugopalan (chairman of the I.S.I. Committee on Cables), and on the other days by Mr. G. N. Green (chief engineer, Eastern Electricity Board, and leader of the United Kingdom delegation). The other members of the United Kingdom delegation were Mr. G. A. Bowie (Crompton Parkinson), Mr. P. W. Cave (B.I.C.C.), Mr. G. E. Heard (C.M.A.), Mr. S. J. Kernick (Sterling Cables), Dr. H. A. Tunstall (Henley's) and Mr. J. F. Stanley (B.S.I.). On all the subjects discussed the B.S.I. had prepared reports as a basis for discussion.

Rubber-Insulated Cables and Flexible Cords.—All the delegations, with the exception of Australia, agreed that only one grade of cable should be standardised for use at voltages up to 400 V to earth, and it was recommended that the national standards should be revised accordingly. The Australian delegation was not satisfied that the present 250 V cables could be regarded as suitable for use at 400 V to earth, and felt that 660 V cable should be used.

This somewhat cautious attitude on the part of Australia was evident also in connection with the thicknesses of insulation. These thicknesses had been reduced in the United Kingdom for 250 V cables through the publication of the 1953 edition of B.S. 7, and it was stated by the United Kingdom delegation that these reduced thicknesses had proved satisfactory.

The reduced thicknesses as given in B.S. 7:1953 for 250 V cables have already been adopted by India and South Africa, but the arguments put forward in support had not been accepted in Australia. At the 1953 Conference Australia had proposed other means of securing economy, such as reducing the rubber content of the insulation and omitting the proofed tape under the braid. Although the cost of the cable was fairly high, it did not compare with the cost of re-wiring a building if the cable failed. The important thing for tropical climates, argued the Australian delegation, was to have physical separation of the conductors. When the cable was used for conduit jobs the rubber became hard in 12 to 18 months after drawing the cable into the conduit, although if left undisturbed the life of the cable might be 20 years. It appeared that the Australian manufacturers were set up to give the higher insulation values prescribed in the Australian Standard C.116, and it would be unwise to alter these values, as even with these thicknesses trouble occurred in tropical climates.

Further discussion revealed that no cables complying with B.S. 7:1953 had so far been tried out in Australia, and it was agreed that no further progress towards unification of standards for the thickness of insulation could be made until all countries, and particularly Australia, had made practical tests with the B.S. 7 cables. Arrangements were made for cables to be supplied for this purpose.

All Commonwealth countries have adopted the method of specifying the thickness of insulation in terms of a minimum average value coupled with a minimum value at any point. It was understood, however, that the South African Bureau of Standards was in favour of specifying the minimum value only. The Conference reaffirmed the 1953 recommendation to maintain the present method. As regards the actual measurement of the average and minimum radial thickness of insulation, the Conference recommended the use, in cases of dispute, of the method given in clause 13 (b) of the Australian Standard C.116-1955, which is more accurate than the method normally used in the United Kingdom.

A difference in viewpoint persists in regard to the desirability of specifying the composition of the rubber compound, the main advocates at the Conference being the United Kingdom, India and Pakistan who do specify the composition, and Australia and South Africa who do not. The view of those who support the United Kingdom practice is that the physical and electrical tests are realistic only if related to a known grade of compound. On the other hand, the Australian and South African Standards are used as approval specifications and are therefore based on tests on finished cables only. It is therefore not practicable to specify the composition since this cannot be checked by a laboratory test, as can the physical and mechanical properties. It was considered, however, that the type of rubber compound standardised in Australia by virtue of the tests was very similar to that prescribed

in B.S. 7:1953. It was reported that South Africa proposed to state the composition, for the purposes of information only, in an appendix to the standard.

Attention was drawn to the fact that since the issue of B.S. 7:1953 the B.S.I. had prepared a new standard for rubber insulation, the rubber content being 50-60 per cent by volume, this being lower than is prescribed in B.S. 7. The Conference recommended that, for those countries which specify composition, the B.S.I.'s new proposals should be accepted in principle, but the B.S.I. was asked to consider the practicability of stating the sulphur content in relation to the rubber hydrocarbon.

The United Kingdom delegation reported that, following a proposal made by Australia at the 1953 Conference, the B.S.I. was giving consideration to the omission, in a future revision of B.S. 7, of tape on single-core 250 V and 660 V braided and compounded cables of sizes up to 7/·064in. The use of tape originated purely from a processing angle, and it was no longer necessary for this purpose. It had been omitted from t.r.s. cables for many years, and recent tests to determine the relative merits of taped and non-taped cables drawn into conduits indicated that the non-taped cable was easy to handle and that there was no detectable abrasion of the braid. The Indian delegation agreed to the omission of the tape, it being stated that conduit installations were going out of use in India.

As regards flexible cords, the 1953 Conference had recommended the elimination of that type known as "cord having reduced thickness of insulation." At the Delhi Conference the United Kingdom delegation said they wished to retain this type of cord, as it was still in demand and was giving complete satisfaction for light office and domestic applications. The Australian delegation said this type of cord was used in their country for portable appliances in dry places, although some authorities deplored its use because of the thin insulation. It is not allowed in South Africa or Pakistan, and there are strong objections to it in India. The Conference therefore noted that this type of cord was recognised for use in non-tropical countries and in dry places on non-conducting floors, but was generally unsuitable for use in tropical countries.

The subject which produced the most lively debate was probably the values of insulation resistance. It was pointed out that the adoption of a rubber insulating compound having a rubber content of 50-60 per cent by volume would result in a reduction in minimum insulation-resistance values as compared with the B.S. 7 values. The United Kingdom delegation emphasised that, despite the lower values for the new compound, the B.S.I. Committee was satisfied that there would be no reduction in the electrical life of ccres incorporating the new compound.

Australia and South Africa accepted the new values proposed by the B.S.I. and the Indian delegation said these values would be carefully considered when the Indian standard was next revised. The present view of the Indian delegation was that they were reluctant to adopt the new figures, since the insulation resistance deteriorated appreciably during the life of an installation in India. In the case of p.v.c. cable it was possible to maintain the insulation resistance for a long time, but not so in the case of rubber cable.

The Conference agreed to recommend that the national standards organisations should consider the acceptance of the United Kingdom proposals subject to further consideration in each country of the implications of these proposals as regards compliance with statutory requirements for insulation resistance and life of installations.

P.v.c.-Insulated Cables and Flexible Cords. — The British Standard for p.v.c. cables and cords, B.S. 2004, covers cables for 250 V or 400 V on a three-phase system with earthed neutral. The United Kingdom delegation said the B.S.I. contemplated extending the specification to cover cables for 660 V and possibly making provision for voltages up to 6·6 kV. The Indian Standard already covers cables for 650 V.

The Conference agreed that the national standards should cover cables for 660 V and that consideration should be given to the problem of suitable compounds and tests to enable the specifications eventually to be extended to provide for voltages up to 6·6 kV.

Many of the points dealt with in connection with rubber-insulated cables arose also during the discussions on p.v.c. cables, and in general the same sort of conclusions were reached.

As regards thickness of insulation, it was noted that in B.S. 2004 the same thicknesses had been adopted as for rubber in B.S. 7. In South Africa it was probable that the insulation thickness standardised for unsheathed cables would be greater than for sheathed cables, the thicknesses for unsheathed cables being as for rubber in the 1946 edition of B.S. 7, while for sheathed cables the values would probably be practically the same as in B.S. 2004.

After a general exchange of views it was recommended that the B.S.I. should seriously consider reducing the thickness of insulation for bare conduit cable (Clause 17 of B.S. 2004). For the 660 V grade, the Conference recommended the adoption of the same thicknesses of insulation as for rubber cables.

It was noted that South Africa had had much experience on the use of p.v.c. for bedding and serving, and it was agreed that all the Commonwealth countries would study the table of p.v.c. thicknesses of bedding and serving as used in that country.

The standard colours of p.v.c. as given in B.S. 2746

Miss M. Hardie (B.S.I.), Mr. J. F. Stanley (B.S.I.), Dr. Verman and Mrs. Verman leaving Parliament House after the inaugural ceremony

were recommended for adoption as preferred standards but should not be regarded as mandatory requirements. It was pointed out that the colours had been specially selected so as to be easily distinguishable from each other under artificial light.

It was recommended that all the Commonwealth countries should consider the Australian and South African specifications for p.v.c. cables having hard-drawn copper conductors for outdoor use.

The physical tests for p.v.c. compounds gave rise to a good deal of discussion. The United Kingdom delegation said that it had been found that the hot deformation test as given in B.S. 2004 was unsatisfactory in several ways. Consequently a new test was being introduced in the United Kingdom, this being done on a moulded sample instead of on the core of the cable. The B.S.I. realised that it might be considered that the hot deformation test should be replaced by a test for the softness of the compound and its flexing properties at normal temperatures. A small Working Group was set up to study the whole problem in preparation for the next Commonwealth Conference. This Group was also requested to give consideration to the method of assessment of the degree of ageing of the p.v.c. compound.

The Indian delegation raised the question of the introduction of specifications for cables having insulation consisting of a thin layer of polythene surrounded by a thin layer of p.v.c. They thought such a cable would have advantages due to the higher insulation resistance of polythene. Other delegations expressed the view that although p.v.c. had a relatively low insulation resistance it was very stable, and was therefore very suitable for the insulation of cables for use in tropical climates. Attention was drawn to B.S. 1557:1954, which deals with cables having insulation entirely of polythene surrounded by a p.v.c. sheath, and it was agreed not to pursue the Indian delegation's suggestion pending the submission of a report on some investigations on the subject at present being made in India.

In the discussion of the question of the protection of p.v.c. cables against attack by termites attention was drawn to a report prepared by the Australian Post Office on the action of termites on thermoplastic-sheathed and aluminium-sheathed cables which indicated that polythene withstood attack better than the normal grade of p.v.c., but hard grades of p.v.c. gave the best results. Aluminium-sheathed cables were not attacked. The general conclusion was that no thermoplastic sheath was immune. There was some evidence to indicate that rigid (unplasticised) p.v.c. seemed to be immune from termite attack.

Metal-Sheathed Paper-Insulated Cables.—It was noted that since the 1953 Conference the B.S.I. had issued a standard for aluminium-sheathed paper-insulated cables (B.S. 480:1954, Part 2) for working voltages up to 22 kV. When aluminium-sheathed cables were first introduced there had been some trouble due to corrosion of the sheath, the reason being that the same protection was applied to the sheath as for lead sheath. As the result of this experience water-impermeable materials were now used and no troubles were being experienced. The question was raised whether aluminium-sheathed cables could be made more flexible, but it appeared that there was little hope of this being done with the swaged seamless sheath. Argon-arc welded-seam corrugated aluminium sheathing was as flexible as lead sheathing, but this was not yet covered by B.S. 480.

At the 1953 Conference there had been some discussion regarding the quality of the paper insulation, and recommendations had been made regarding the limits of water-soluble impurities and weight of ash, but no test procedures had been agreed upon for the determination of these quantities. The B.S.I. have now drafted proposed methods of test, including tests for conductivity and pH value, which would reveal the presence of harmful substances in the paper. The Conference agreed to recommend the adoption of these proposals.

The United Kingdom delegation put forward a simplified proposal for the method of measurement of insulation thickness, and the Conference recommended that this should be adopted. It was stated that in Rhodesia and South Africa breakdowns had been experienced with cables complying with B.S. 480 at points immediately adjacent to terminations. It was felt by the authorities in these countries that the specified insulation thicknesses were not sufficient and that the only satisfactory solution was the use of non-draining 11 kV cables with resin impregnating compound, having increased insulation thicknesses.

The United Kingdom delegation suggested that in order to meet the wishes of Rhodesia and South Africa additional tables should be included in B.S. 480 giving requirements in respect of 11 kV, single-core and three-core belted-type (earthed and unearthed), and three-core screened-type (earthed) cables for use under specially onerous conditions. This was agreed in principle and tables of dimensions were drawn up for submission to the national standards organisations.

The United Kingdom delegation explained that the thicknesses of lead sheath as given in B.S. 480 followed closely the recommendations of the 1953 Conference, but recent discussions on international standards for ships' cables had shown that thinner sheaths were commonly accepted in European countries. The delegation therefore put forward a revised table of sheath thicknesses for discussion, it being explained that this was not a definite proposal which had been approved by the B.S.I. United Kingdom manufacturers had to meet competition from other countries and the only way of achieving any reduction in the price of cable seemed to be to reduce the amount of metal in the sheath. The problem was largely a mechanical one, and it was stated that an investigation, based mainly on a bending test, was being made in the United Kingdom.

Some of the other delegations were reluctant to agree to a reduction of the sheath thickness, one reason being that inadequate thickness rendered plumbing operations difficult. It was agreed to await the conclusions of the B.S.I. before making any recommendation.

As regards electrical tests, it was noted that in B.S. 480:1954 the power factor test was specified for 33 kV cables only. It was recommended that a power factor test should be specified as an optional test for 22 kV as well as for 33 kV cables of the radial field type, i.e. screened-type, SL-type, and single-core cables, but excluding belted-type cables.

The question of impulse tests was raised and it was explained that it was the view in the United Kingdom that the impulse strength of 11 kV and 22 kV cables was so high that there was no need to apply a test; even for 33 kV cables the margin was so great that it was not thought worth while doing a test as a sample test, but only as a type test. The Conference agreed to recommend that for 11 kV cables the impulse level should be stated in the national specifications for purposes of information, but that no test should be called for. For 22 kV cables an optional type test should be specified, while for 33 kV cables a type test should be definitely called for in the specification.

On the subject of bending tests it was suggested by the

Australian delegation that consideration be given to the following alternatives:—

(i) Two separate samples, one having the armouring removed, should be subjected to the test, the diameter of the mandrels being related to the overall diameter and the diameter over the lead sheath respectively.

(ii) One cycle of bending should be conducted on the armoured cable, the diameter of the mandrel being related to the diameter of the cable, the armouring being sound following this test. The armouring should then be removed and two cycles of bending should be conducted, the diameter of the mandrel being related to the diameter over the lead sheath.

Both this and the test given in B.S. 480 differed from the test recommended by the International Electrotechnical Commission and the Conference set up a sub-committee to look into the matter further. This sub-committee consequently presented a report in which proposals were made for a bending test which was closely in line with the I.E.C. test. This will be studied by the National Committees.

Because of the development of non-draining cables having a fully impregnated dielectric, suitable for vertical installation, the drainage test in B.S. 480:1954 was no longer suitable. The United Kingdom delegation therefore submitted a revised test which has already been issued as an amendment to B.S. 480. Agreement was also reached on a test proposed by the B.S.I. for application to cables provided with a fire-resisting finish, subject, however, to its being permissible to use a Bunsen burner as an alternative to the Barthel burner.

The standard finishes described in B.S. 480 and similar standards are usually composed entirely of fibrous materials and compound, and are not always sufficient protection when the cable is to be laid under conditions known to be harmful to the sheath or armour. The United Kingdom delegation therefore proposed the "saline bath" test, for application as a type test to special anti-corrosion finishes. This is in essence a test of water-proofness, and the test is made in such a way that the resulting electro-osmotic pressure acts to drive the salt solution through any weak point in the covering. The Conference recommended the adoption of this proposal, together with a routine test consisting of the application of a d.c. voltage of 10 kV for one minute across the covering of the cable, at the works and again on site after laying.

The question of protection against attack by termites, which had already been raised in connection with p.v.c.-insulated cables, arose again in connection with paper-insulated cables. The present practice of United Kingdom manufacturers, when anti-termite finishes are called for, was stated to be to include a proportion of arsenious compounds, metallic napthanates or chlorinated naphthalene in the serving, but the only method of protection believed to be entirely effective was the application of brass or copper over the sheath. The Australian delegation submitted a report which showed that the application of the insecticide type of additive to the serving did not prevent attack by termites but might kill them in the process of attacking. It appeared that the best results were obtained by the use of a termite repellant along the cable run. Reference was also made to the problem of micro-biological attack, and it appeared that attempts to find a way of preventing decomposition of the jute had not been entirely satisfactory. There were, however, ways of overcoming the problem, such as by applying p.v.c. over the lead.

On the question of current ratings and operating temperatures, the Conference recommended acceptance of the E.R.A. report F/T128.

Aluminium Conductors for Insulated Cables.—Amongst the subjects discussed for the first time at the Delhi Conference was the increasing use of aluminium conductors in cables. To meet this situation the B.S.I. had issued B.S. 2791:1956, and this was submitted to the Conference for purposes of information.

It was stated that in Australia this type of cable was accepted for general use provided that the conductor was composed of at least 19 strands. The smallest size permitted was 19/·064in, and the cables were given a rating of 84 per cent of the current rating of the equivalent copper conductors.

Several delegates expressed the view that the inclusion in B.S. 2791 of a list of the nearest equivalent copper sizes to each of the aluminium wires caused confusion, and the Conference decided to recommend the adoption of the aluminium strand formations as given in B.S. 2791, but to make no recommendation regarding the equivalence between copper and aluminium sizes.

(To be concluded.)

"Stereosonic" Reproduction

A METHOD of stereophonic recording and reproduction, termed the "stereosonic" system, which is characterised by the use of spaced loudspeakers driven in phase, formed the subject of a paper presented on 20th February before the Radio and Telecommunication Section of the Institution of Electrical Engineers by Messrs. H. A. M. Clark and P. B. Vanderlyn and Dr. G. F. Dutton (Electric & Musical Industries). The authors described the principles and equipment for what is essentially a two-way channel system for domestic tape records based on the early work of A. D. Blumlein (1929-30) and developed the mathematical theory involved in its use. The advent of magnetic tape, providing two synchronous but otherwise independent channels, had made commercial exploitation possible. A full-scale public demonstration was given in April, 1956, at the Royal Festival Hall.

In opening the discussion, Mr. J. Moir was inclined to think the authors had under-stated the advantage of running these tapes at home. The spatial separation given to the orchestra was most effective. It separated the instruments and gave greatly increased clarity merely because the sound approached the head from different angles. It effected an improvement that could not be obtained with the normal system, no matter how low the harmonic distortions were reduced.

Mr. B. E. G. Mittell said that the test of any new system was whether it had sound practical use for the ordinary listener who was not able to make the exaggerated tests to which reference had been made. He had heard tests made with simple apparatus, however, and people who had heard them had a very pleasant recollection of the results.

Dr. E. C. Cherry remarked that stereophony was impossible in absolute theory for a variety of reasons. One obvious reason was that the acoustic properties in a studio were not those of the living room and therefore the situation was not reciprocal. However, the authors had performed an engineering feat of considerable magnitude and he did not wish to detract from the success of their demonstration and its value. He agreed that directional hearing was not yet fully understood.

Mr. A. M. Thornton said he assumed the authors had in mind high quality and more realistic recording for the future and that their system would ultimately replace the normal gramophone records. He pointed out that the conductor of an orchestra had a completely different idea of what was going on from that of the audience. This had obvious applications and he would like to know how the authors would educate people to listen from an aspect different from the normal distance listening.

Spark Machining

PRINCIPLES AND APPLICATIONS ANALYSED

IN a paper on "Principles and Applications of Spark Machining," which he read before a meeting of the Institution of Mechanical Engineers on February 22nd, Mr. W. Rudorff pointed out that this process consisted in the production of spark discharges in rapid succession between a cutting electrode and a workpiece electrode. The intensity of the discharges was determined by the amount of electrical energy supplied from a storing device, such as a condenser. The discharges occurred when the potential difference between the electrodes was raised to such a value that electric breakdown took place in the medium filling the interspace with the consequent production of a conductive bridge. If the interspace was filled with a liquid dielectric, such as hydrocarbon oil, and a distance of about 0·025 mm was maintained between the electrodes, breakdown leading to the formation of a spark would occur at a potential difference of some 110 V.

Operating Conditions

After the condenser had discharged and the dielectric had become de-ionised recharging took place and the next discharge followed. The interval between successive discharges had to be adjusted so that there was sufficient time after each for the dielectric to become de-ionised and for the metal particles to be washed away from the workpiece and cutting electrode. The resulting spark repetition rate which could be achieved with different condenser capacities varied with the operating conditions, but with a gap breakdown voltage of 150 V the repetition might be expected to lie between 10,000 sparks per second with a condenser capacity of 0·25 microfarad and 380 sparks per second with a condenser capacity of 256 microfarads.

In spark erosion machines a liquid hydrocarbon, such as transformer or paraffin oil, was generally employed as a dielectric. The essential requirements were high dielectric strength, rapid quenching of the spark after the discharge had taken place and as speedy a breakdown as possible under given voltage and spark gap conditions once the breakdown voltage had been applied. In addition the fluid must provide an effective cooling medium, be capable of carrying away swarf and have a high degree of fluidity. Tests had shown that for general use a mixture of light naphthenic machine oil and paraffin oil resulted in a rate of material removal of 25 to 30 per cent in excess of that obtained with paraffin oil alone.

A typical spark-machining installation described in the paper consisted of four working heads which were supplied with direct current from the three-phase mains through 6·5 kW selenium rectifiers. In each head assembly a bath for the immersion of the workpiece electrode in the dielectric fluid was mounted on a table to provide lateral movement relative to the tool electrode, which was attached to a servo-controlled ram within the head itself. Vertical and radial movement of the latter about a vertical column was also provided.

Feed-control mechanism was provided to maintain the gap between the electrode and the workpiece at the distance at which spark-over would occur at the predetermined voltage. Since during operation both the workpiece and the tool electrode were eroded, this control had to maintain the movement of the electrode towards the workpiece at such a speed that the sparking voltage remained at its prescribed value. Since the gap width was very small, about 0·001 to 0·002in, any tendency of the mechanism to hunt was highly undesirable. Rapid response was also essential and this implied a low-inertia driving mechanism. Since overshooting during the operation of the control might lead to a complete closing of the gap and a short circuit between the workpiece and electrode, rapid reversal of the feed motion was necessary and any backlash in the mechanism was detrimental. These conditions were ensured by an error-indication signal, obtained from an electrical sensing device, which was responsive either to the gap voltage or to the working current or to both. In a typical arrangement a servo-mechanism controlled by a bridge network and potential divider effected the movement of a reversible motor so that it lowered the electrode to establish the correct working gap width and maintain it as erosion occurred. It could also raise the electrode should the gap become bridged by an accumulation of swarf or be short-circuited by the control overshooting.

In all spark-machining operations the choice of the electrical parameters of the circuit exerted an over-riding influence upon the rate at which material was removed from the workpiece; this depended on the voltage at the spark gap and on the condenser capacity. As in practice spark-gap units were built for constant operating voltages variation of the condenser capacity was the most effective means of controlling the rate at which the material was removed. This rate would generally increase with the capacity of the condenser, although a point would be reached when the amount of swarf dispersed in the dielectric liquid became so great that it could not be removed rapidly enough from the spark gap and arcing would result. Flushing of the gap by forcing dielectric liquid through it was therefore essential when a high cutting speed was aimed at.

The weight loss of the cutting electrode and the workpiece depended to a considerable extent upon the material used for the former. Up to the present various brasses and copper had been found to be most generally suitable, although higher cutting rates could be attained with silver, graphite or carbon.

The spark erosion process enabled materials to be machined, which because of their hardness or toughness, could not be dealt with by conventional tools. It could be used to produce irregular or intricate shapes and openings which were difficult or impossible to form in other ways. These matters were dealt with in detail in the paper.

Instrument Film

Crompton Parkinson, Ltd., have available on loan a 10-minute running time, 16 mm, sound and colour film entitled "Strictly Instrumental." In this film various electrical measuring instruments are divested of their outer jackets and taken to pieces. Easily understood commentary, supported by animated pictures, demonstrates why the pointer moves and registers. The assembly of instruments can be seen, and mechanical tests to ensure that they will stand up to every form of shock and vibration which they are liable to encounter in service are demonstrated. Educational establishments, trade associations and other organisations wishing to borrow the film should apply to Crompton Parkinson, Ltd., Ref. SA., Crompton House, Aldwych, W.C.2.

ELECTRONIC CONTROL EQUIPMENT

Comprehensive Activities at Rugeley Works

TEN years ago a small group was formed to pursue the possibilities offered by electronic control equipment which, it was considered, were not at that time being fully exploited. Since then the company formed in 1946 as British Electronic Products, Ltd., and now Lancashire Dynamo Electronic Products, Ltd., has expanded until, with a complement of over 350, it is able to take on practically any type of electronic control apparatus.

Last week the leaders of the original group, who are still in control, Messrs. R. Bent, S. Burr and R. J. F. Howard, conducted editors of the electrical Press round the company's establishment at Rugeley, Staffordshire, and the party was joined by Mr. S. F. Steward, chairman of Lancashire Dynamo Holdings, Ltd., and Lord Halsbury, chairman of the National Research Development Corporation. The visitors were introduced to an almost bewildering variety of control equipment for a multitude of applications: the company has been responsible for about two thousand different designs, only a comparatively small proportion of which could in any way be called " standard." The visitors began by looking at the photocopying and teleprinter services and darkrooms for printed circuit development and general experimental use. They proceeded through the stores to the metalwork shop where a variety of structures and parts are fabricated from steel, aluminium and non-ferrous alloys. Of special interest was a Weidemann turret press capable of punching out circular and rectangular holes of many sizes by way of a diagram followed by the operator.

Adjoining this shop are paint spraying cubicles for applying the stove-enamel finishes. In a separate department special equipments are given high-quality cellulose coatings (up to seven on occasion).

In the light assembly section the smaller chassis and sub-assemblies are put together with the aid of power-operated tools manipulated very deftly by female operatives who are also employed in the wiring section. Small batches are dealt with on rotating tables, the operator performing one operation on each item in turn. For larger quantities a form of line production is used. The wires used in the assemblies are cut to length and end-stripped in a special machine.

Operatives in the wiring section work to " breakdown " diagrams prepared in the methods department alongside which is the works planning office which observes and controls the progress of each order. There is another section in which special units are wired. Its purpose is to deal with chassis where, perhaps, only one of a kind is required and the female operators are specially trained to work from theoretical circuit diagrams, thus avoiding the provision of more elaborate data.

Heavier equipment is handled in another section and

1. *Heavy equipment section of Test Department at the Rugeley works*

2. *Small equipment section of Test Department*

3. *Automatic temperature regulator equipment on test*

after assembly is transported by overhead crane to the test department. This department has sections for dealing with small and large pieces of equipment. Provision is made for testing drives and a machine room houses installations giving d.c. and a.c. supplies at various frequencies.

A cardwheel system is employed in the material control office for keeping track of stores and in this section are the purchasing administration and control arrangements for special materials.

The machine shop, in common with the other sections, is organised to deal with small quantities of specialised precision and semi-precision work, including mechanical assembly.

A feature of the drawing office is that the bulk of the drawings are not taken beyond the pencil stage. The maximum use is made of standard drawings in the preparation of complete layouts. Associated with the drawing office is the print room one feature of which is a machine for producing the forms used in the material control and allied systems. The drawing office operates on data received from the design office where customers' specifications are converted into detailed circuit arrangements and components.

There are four development laboratories each with a senior development engineer and all controlled by the chief development engineer. In each of these the visitors were given demonstrations of the work in hand.

Repairs are carried out in a service and field operations department and there is a demonstration room in which several types of equipment are shown performing their functions.

Work is proceeding on the erection of extensions to add 12,000 sq ft to the existing 50,000 sq ft of floor area.

It is difficult to select typical examples from the multitudinous designs for which the company has been responsible, ranging as they do from oil-burner control equipment to the control of 1,000 h.p. drives, but to give an idea of the scope we may mention some of the developments which have taken place in the past few years.

The first large multi-motor drive controls were produced in 1948 when other work consisted of large radio-frequency heaters, synchronous welding control equipment and high-accuracy regulators for electrical machines. In 1949 the first large multi-motor electronic Ward-Leonard drive was installed on a steel-strip pickling line. When, in 1950, the company joined the Lancashire Dynamo Group work started on the development of automatic machine tool controls, particularly for profile following, and counting and batching equipment was produced.

In 1952 special power supplies were developed and produced for Ferranti and "Leo" computers and multi-motor electronic drives for biscuit-making machines for export to South Africa were supplied. The resistance welding control equipment range was extended in 1953 by the introduction of capacitor energy storage equipment and in the same year a large quantity of photo-electric controls for cloth-cropping machines for Russia was produced. Other items were remote radio control equipment for the control of an aerial ropeway to an offshore oil rig and high performance magnetic-amplifier voltage and frequency regulators for the Admiralty.

Subsequent developments included special temperature regulators for glass fibre production, equipment for process control, etc., for the sugar industry, "Autocount" woollen web density control, computer power supplies and machine tool control systems, including one for the world's largest openside plano-miller in Canada.

More recently the company has received large orders for resistance welding control equipment for the automobile industry, much of it for Australia, large automatic temperature regulators for glass furnaces for Australia and New Zealand, and "Autocount" equipments for a number of foreign countries.

This review of activities can give only a general idea of the company's scope. The impression gained from the visit was that there can be few establishments in which so many and such varied activities are carried on in a relatively small area.

Mechanical Strength of Transformers

AT a meeting of the Institution of Electrical Engineers on Wednesday, Mr. E. T. Norris (Ferranti, Ltd.) dealt with the mechanical strength of power transformers in service. He said that stresses had steadily increased with transformer size and supply system capacity as reflected in the rupturing capacity of circuit-breakers, which had increased in 25 years from 1,500 to 25,000 MVA. This effect had been intensified by auto-reclosing of switchgear on to possible faults, which had become normal practice; also phase-to-earth fault throwing for intertripping seemed likely to increase.

The principal forces imposed on transformer windings were radial and axial. With concentric windings the first called for adequate support of the inner winding, while the outer winding relied upon the tensile strength of the conductor; radial stresses had not generally been regarded as very serious. Axial forces included unavoidable compression of both windings and displacement due to electromagnetic dissymmetry from a number of causes.

It was affirmed that the mechanical strength of a transformer under short circuit was not a simple single value as was implied in national standard specifications, which were criticised as unrepresentative of operating conditions in two major aspects. One was the requirement that full line voltage should be maintained, implying a supply system of zero impedance and the existence of short-circuit testing stations of a capacity great enough for testing the largest power transformers. The author suggested that the minimum external impedance, including directly connected apparatus and the supply system impedance, should be specified by the purchaser and that the resulting short-circuit rating should be marked on the name plate.

The other aspect was the falsity of the implication that a transformer complying with the specification would be necessarily short-circuit proof. At least ten fully asymmetrical short circuits were required in any test to give conclusive results, owing to the progressive or cumulative nature of the stresses which led to short-term and long-term characteristics. The resulting categories of mechanical strength were defined as initial, critical and ultimate, the last named being usually the crucial one. From an analysis of records of failures on short circuits it had been found that the expectation of life could be predicted for any given operating conditions. Methods of improving the expectation of life were considered.

Electricity Bill in Committee

Composition of Proposed Council Debated

WHEN the committee discussion on the Electricity Bill was resumed last week Mr. David Renton moved an amendment to Clause 3 to ensure that the functions of the Central Electricity Authority under the 1947 Act and other enactments were transferred to the new Electricity Council. The addition of the new words, he said, would enable the Council to exercise four functions of the C.E.A.: the duty to collaborate with the Scottish Boards, the duty of making payments in lieu of rates, the power to use Exchequer advances between 1st January and 31st March, 1958, and the duty of paying income tax and profits tax on behalf of the Boards. The amendment was agreed to.

An Opposition amendment making it obligatory for the Minister to appoint two deputy chairmen of the Electricity Council was agreed to.

Sir Frank Soskice moved an amendment to ensure that either the chairman or one of the two deputy chairmen of the Council should be a person having had experience of, or shown capacity in, the organisation of workers. His amendment that there should be three nominated members who would not be representatives either of the Generating Board or of the Area Boards was discussed at the same time. He said that if the Committee accepted his proposition the Council would consist of three members nominated by the Minister, three representing the Generating Board, and the remaining members would be the chairmen of the twelve Area Boards—a total of eighteen. The Opposition sought to bring the Bill nearer to the recommendations of the Herbert Committee, and felt that the Government had not had sufficiently in mind the desirability of a nation-wide, co-ordinated industry. If responsibility was devolved as fully as it was under the Bill upon the Area Boards too little regard might be had for the development of the industry to serve the nation-wide need. They sought to fit the Council better for exercising a degree of supervision and to bring the activities of all the Boards within the scope of a nation-wide plan. They thought that the Generating Board should be represented by two members, not one. As the Bill stood now it was overweighted in favour of the distributing side of the industry.

Additional Independent Members Suggested

Mr. Fort had down an amendment which would have added to the Council four independent members appointed by the Minister. He said he knew from experience that those responsible for engineering design often got into a groove from which they were shaken only when someone knowledgeable in that branch of engineering asked "Why in the world are you going on in this way? Why have you not considered this variation?" Another reason was that there were arrangements for appeals to the Electricity Council and unless outside members were brought in there would be a wide feeling that this appeal procedure was a fraud.

Mr. Warbey referred to an amendment in his name stating that in addition to the members specified in the Bill the Minister should appoint seven other members representing the National Coal Board, the Atomic Energy Authority, the Bank of England, the Consultative Councils, the Co-operative Union, the Trades Union Congress and the Federation of British Industries. He said his object was to create a central organ for this great nationalised industry adequate for the functions and powers given to it.

Asked by Mr. Nabarro why he had omitted representatives of the Scottish Boards, Mr. Warbey said he would have no objection to such representatives being included. Another two on top of 24 or 25 members would make no substantial difference. At the moment the Bill proposed a Council completely overweighted on the distribution side of the industry. Whatever the Minister did about these amendments he must get rid of this top-heavy structure.

Primarily a Co-ordinating Body

Mr. Reginald Maudling, Paymaster-General, explained that the Government had never thought of the Council as an executive authority in the sense of the present C.E.A., but primarily as a co-ordinating body, a forum where the men responsible for running the industry could meet and discuss their common problems and be assisted by the presence of independent individuals. The underlying principle of the Bill was the separation of generation from distribution and the devolution of responsibility for distribution. The Government were placing on the Area Boards and the Generating Board the responsibility to pay their way and to act as autonomous entities. In the Council the people charged with these heavy responsibilities would meet and discuss their common problems and formulate common policies where they were needed in the interests of the industry as a whole.

The Council should not be thought of as a place where disputes could be settled or where conflicting interests would clash. Estimates based on the number of distributing and generating people were a little beside the mark. He regarded the Council as something rather akin to a Cabinet, or O.E.E.C., or even the board of directors of a large holding company, where it was not normal to proceed by way of votes or numerical superiority one way or the other.

Amendment on Report Stage

The Government agreed to accept the amendment which would increase the number of independent members from one to three. Mr. Fort had suggested the addition of four. There might be an advantage in increasing the independents to more than three but to go up to seven might be too much. Between now and the Report Stage he would reflect on these suggestions and would discuss them with the Minister of Power. The Government would put down an amendment for the Report Stage to appoint some more independent members but he doubted whether they would go beyond two more.

He had much sympathy with the suggestion that the Generating Board's representation should go up from two to three because they would be able to represent more fully the engineering, financial and other functions of the Generating Board. He would discuss this point with the Minister of Power and see if it could be met.

On the question of qualifications, these were deliberately omitted in the case of the independent members. With the Herbert Committee, the Government felt that the

Minister should be given the greatest possible discretion here. It would be unwise to fetter him in the way suggested.

Mr. Palmer said the Minister had overlooked one important consideration. The Council would be responsible for establishing the wage and salary negotiating machinery. Therefore the Opposition had suggested a representative on the Council, possibly a deputy chairman, having knowledge and experience of labour relations.

Mr. Maudling said it was certainly consistent with that idea that a man or woman with these qualifications should be appointed, but the Committee should not put a statutory duty on the Minister to appoint someone with those qualifications. The Government were following the recommendations of the Herbert Committee in this respect.

Mr. Palmer felt that the Minister should not be complacent and say "We shall depend on good sense and voluntary co-operation." Who was to decide if a dispute arose between the interests of distribution and generation over capital allocation? The conclusion was that it must be the Minister of Power himself. There might be an argument for that, but if the Minister was to resolve these things and the Council was to be only advisory there would be more, and not less, Government control over the affairs of the industry. There was a special case, he said, for appointing as chairman or as one of the deputy chairmen a person having had experience in labour relations because the Bill placed on the Council responsibility for wage and salary agreements with trade unions. If the Paymaster-General could not give some stronger assurance on this point the Opposition would press this amendment to a division.

Mr. Nabarro said the right independent representation was midway between what was suggested by Mr. Warbey and what was suggested by the Minister. Clearly the Bill in its present form would not do. He would propose an organisation of a chairman, two deputy chairmen, and twelve members who would consist of four representing the Generating Board, four representing the Area Board chairmen, and four independent members. The four Generating Board men would consist of two representing nuclear generation interests and two orthodox generation. One of the Area Board representatives would have to represent the Scottish Boards. The four independent members would consist of two representing industrial interests and two representing the trade unions.

Mr. Jack Jones said the Minister suggested that there should be no contention in the Council; it should be a forum and the members would have a discussion, a good lunch and a cigar and then go away. He did not want such a body in charge of a vital national service. The Government's proposed composition of the Council did not appeal to him as being one likely to look after the national interest.

The motion was negatived by 20 votes to 14.

Bulk Supply Tariff Decisions

Mr. Palmer moved an amendment to make it the function of the Council "to fix the prices to be charged by the Generating Board for the supply of electricity to the Area Boards." He said that the Herbert Committee had pointed out how the solvency of the Boards would depend on a correct tariff policy, and had recommended that the responsibility for fixing the bulk supply tariff should go to the Central Authority. In the Bill it was left with the Generating Board, although there was to be consultation with the Council. In the Opposition's view the Generating Board was much too biased a body to make this decision on its own. One could visualise the situation which might arise where, because an unreasonably onerous bulk supply charge was made, an Area Board might be forced into the "red." The idea in Clause 10 was that the Area Boards should pay their way and there should be some way in which the commercial efficiency of the Boards could be checked. This would be difficult if they did not all start off roughly from the same point.

Economic Key to Solvency

When the Committee reassembled on 21st February, Mr. Palmer said that in the *Electrical Review* of 21st December Mr. D. J. Bolton, who was an accepted authority on economic matters in the electricity supply industry, wrote concerning the supply tariff:—

> ". . . here the Generating Board and the Area Boards will be lined up solidly on opposite sides. Moreover, the issue will be of absolutely paramount importance to both sides. Virtually the whole income of the Generating Board is derived from the bulk supply tariff whilst nearly 70 per cent of the Area Boards' expenses go in this direction. Increase the tariff by 5 per cent and the Generating Board will show a handsome surplus while every Area Board will be 'in the red.' Decrease it by 5 per cent and all the surpluses will be on the other side."

That was a very powerful witness in support of the view he had already advanced, that the bulk supply tariff was really an economic key to the relative solvency of the various parts of the industry under the new dispensation.

It was not the Opposition's wish at this stage to argue the merits or demerits of one particular form of tariff against another, or whether there should be a standard bulk supply tariff, although he personally leant towards that view because unless the Area Boards all started economically at the same point it would be difficult to judge their practical commercial efficiency later. The matter was of such tremendous importance to the whole organisation and successful economic working of the industry that this power of fixing the bulk supply tariff should be with the Electricity Council because the Council, unlike the Generating Board, could take a general all-round view of the situation.

Safeguards Against Excessive Charges

Mr. Renton said that the Herbert Committee had recommended not that the Council should fix the tariffs but should approve them. "To fix" in Parliamentary usage, implied both the initial and final responsibility; "to approve" meant only the final responsibility. It must also be remembered that the Committee had envisaged a more authoritarian central body than the Council would be. It was significant that, even then, they proposed only that the authority should have power "to approve."

It would be a deplorable thing if the Generating Board used its power to fix tariffs in such a way as to make exorbitant charges to the Area Boards. Mr. Palmer had envisaged a situation in which an Area Board might be forced "into the red" because of this. But the Government took the view that the Generating Board would have a responsible attitude towards its duties. Even if the Opposition's fears were valid there were various safeguards. First, the Council must be consulted by the Generating Board before it fixed the charges. Secondly, the Government proposed to put in a new Clause which stated: "The Council may make representations to the Minister on any matters arising out of advice given by them to an Electricity Board . . . and if it appears to the Minister . . . that a defect is disclosed in that Board's general plans and arrangements for the performance of their functions, he may give such directions to that Board

as he thinks necessary for remedying the defect." Thus it was provided that if a dispute or difference arose between an Area Board and the Generating Board it could be referred formally to the Council and the Council, in the last resort, could refer it to the Minister for his decision.

Thirdly, it was proposed to increase the powers of the Consultative Councils so that they would have the power to make representations about bulk supply charges, and there was also the provision in Clause 19—and this applied to the possibility of exorbitant charges and the accumulation of surpluses—for the Minister to order an Area Board to dispose of its surpluses in any way which he might direct.

With these four safeguards, the Government were convinced that it was best to give the Generating Board the primary and ultimate responsibility for fixing its charges. It would be contrary to the Board's financial autonomy to place that responsibility on the Council, and it would be contrary to the consultative and advisory character of the Council as well.

Mr. Warbey said that the safeguards did not give him much consolation; they gave powers for people to make representations but no more than that. The mere fact that such power was being given indicated that the Government anticipated that there might be occasions when disputes would arise.

Minister's Powers of Direction

Sir Frank Soskice considered that the Opposition's amendment was closer to the Herbert Committee's recommendations than the Government's proposal. Clause 19 gave the Minister only general powers of direction. It was very doubtful if the Minister would have effective power to change a bulk supply tariff.

Mr. Renton said that this would be possible, and Mr. Maudling intervened to say that the wording of the new Clause had been taken from the 1947 Act, giving the Minister power to act on the advice of the Electricity Council.

Sir Frank Soskice said that might have been effective under the old system, but it was precisely because the Central Electricity Authority was being carved into two parts that this amendment had been put down. It became more evident as the discussions continued that the Council was too loose an organisation; there must be a strong central authority with the function of gathering together all the activities of the Boards and making them conform to the policy which was best in the national interest. It was not enough for the Government to say that the Generating Board would act responsibly; the Council should have greater power so that it could direct and co-ordinate the activities of all the Boards.

Mr. Renton replied that the Government had come to the conclusion that it was inconsistent with the autonomy of the Generating Board for the Council to have power to fix bulk supply tariffs. They had followed a precedent in the gas industry. What would happen was that if one Area Board was dissatisfied with the tariff, it could make a formal representation to the Council; the Council would then have power to give advice which might lead to the difference being settled. If the Council's advice was not followed by the Generating Board the Council could refer the matter to the Minister for decision.

Mr. Nabarro said that as the law stood the Minister would have no power to adjudicate on prices.

Mr. Renton agreed that that was the present law, but said that when the Bill was passed the Minister would have that power. He would be able to give such directions as he thought necessary " to remedy the defect."

Mr. Palmer again returned to his argument by quoting a leading article from the *Electrical Review*. This had stated:—

> " The bulk supply tariff is the economic link between the two main branches of electricity supply, generation and distribution. Small changes in its magnitude have power to wreck the finances of either branch and in this respect the interests of the two branches are diametrically opposed since one is the buyer and the other is the seller. The absence of any over-riding authority in the industry will not make the solution any easier."

That came from a source, an impartial trade paper with great knowledge of the industry, which should not be disregarded by the Government. That paper was obviously doubtful about the soundness of the Government's scheme.

No further reply was given by the Government, and the Opposition indicated that they would return to the subject at a later stage. The amendment was negatived by 22 votes to 14.

Sir Frank Soskice moved an amendment to give the Council power to make arrangements for performing services of common interest to all the Boards, without its needing the authorisation of one or a group of Boards. He gave as examples such services as medical research, education and training, and public relations.

Mr. Maudling said it was accepted in the Bill that certain services should be carried out by the Council for the industry as a whole. Medical research was an example, and there were others, but it was right that the Boards' powers to run their own affairs should be preserved. They would wish that certain common services should be run by the Council, but in matters like public relations and training they should be allowed to decide for themselves.

The amendment was negatived by 22 votes to 13.

Mr. Maudling moved an amendment to ensure that the power to make regulations concerning the activities of the Electricity Council, the tenure of office of its members, and about the composition and activities of the Area Boards, was subject to Parliamentary control.

The amendment was agreed to.

Central Planning

On the motion that Clause 3 should stand part of the Bill, Mr. Warbey said it was essential to have an effective central authority with supervisory and executive functions to ensure planning co-ordination in the general public interest. This could not be left safely in the hands of the regional boards.

Mr. Richard Fort said there was a great need for a centralised personnel department. His experience with I.C.I. showed that if large organisations were to attract the quality of staffs that they wanted it was not only the salaries which attracted men, but also the prospects.

Mr. Palmer regretted that the Minister had not been more helpful on some of the admendments although he had promised to look again at the Council and might be able to put forward some new ideas on the report stage.

Mr. Maudling said he would reconsider the composition of the Council. He had not said that the Government would reconsider the functions of the Council.

Mr. Palmer said that would be a great mistake. The Herbert Committee's solution had weaknesses but it would have been better to move towards their proposals and away from the Government's. The Committee suggested a federal structure with reserve powers for the central authority; the Government proposed a confederation relying on the good sense and voluntary co-operation of the parties concerned. It was difficult

to translate such idealism into practice. In fact it would be found that the Minister would have much more power and he would have to resolve the differences.

There was still great uncertainty among the existing staff about where they would stand when the change took place. The Council had yet to be created and it was not clear whether it would start from scratch by recruiting its own staff or whether there would be transfers from the C.E.A.

On Tuesday last when Clause 7 (" Powers of Minister in relation to Electricity Council and Electricity Boards ") was discussed Mr. Maudling gave an assurance that the powers in the Bill would not be used to prevent the Area Boards from carrying on their retail trading activities.

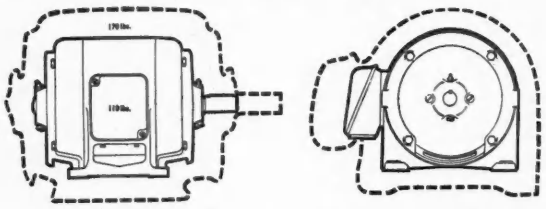
He was replying to an Opposition amendment which was designed to prevent the Minister of Power from giving a direction to any Area Board to dispose of premises, plant or equipment used for the purpose of retail distribution or the service and maintenance of such equipment.

Mr. Alfred Robens (Labour) asked the Minister to write his assurance into the Bill so that there would be no doubt about the rights of the Area Boards. The Opposition asked for this because so many attacks had been made by Conservative members on the retail trading activities of the Boards.

The debate on the amendment was adjourned until yesterday (Thursday).

NEW CLASS "E" INSULATION MOTORS

A NEW range of drip-proof motors of the ½ h.p. to 50 h.p. group, designed to comply with draft B.S. CW(ELE)6246 (dimensionally) and B.S. 2613 (electrical performance), amended to include Class " E " insulation, is announced by Newman Industries, Ltd. The introduction of this new group has resulted in substantial economy in the initial cost for the majority of applications where the protection afforded by drip-proof enclosure is considered adequate, i.e. pumps, fans, compressors, agricultural equipment, etc.



Weight and size comparisons between the average 7½ h.p. Class " A " insulation motor and the equivalent new Class " E " insulation motor

Draft B.S. specification CW(ELE)6246 standardises for the first time the dimensions of three-phase motors with ventilated enclosures, and the most important feature of the specification is that it covers motors built to the amended B.S. 2613 (electrical performance), incorporating Class " E " insulation which permits a maximum motor temperature rise of 65 deg C under continuous maximum rating conditions.

Considerable reductions have been achieved in space and weight and have resulted in a greater permitted output for a given motor frame size. The new motor is a normal squirrel-cage induction motor of the simplest construction, and the manufacturers claim that the maximum ventilation efficiency of an " open " type motor has been retained, but with a degree of protection much greater than is usual with this kind of motor by fitting pressed " air deflectors " over the end windings. These deflectors are designed to give more correct and efficient air flow over the bearings and within the motor. They also give complete protection to the windings.

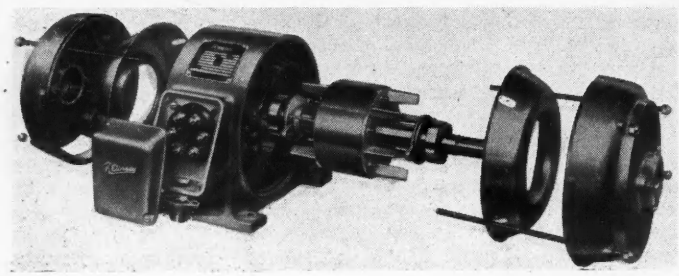
Other features of the new motor are an improved all-round performance, a new terminal box which facilitates wiring and installation, and an electronically controlled balancing machine test for every motor to ensure vibration free running. The stator core is prebuilt from low-loss silicon steel sheet and the stator frame is a rigid one-piece normalised iron casting produced in the company's own foundry. Slot insulation consists of a thick triacetate-covered leather paper and this material is also placed between the coil sides in the slot, while two thicknesses of the same material are inserted between phase groups in the winding.

The squirrel-cage winding is die cast around the core in aluminium, integral with the cooling fan. End brackets can be turned easily so that ventilation is at the top of the motor, thus giving drip-proof protection when ceiling mounted. Openings are provided in the underside of each end bracket to allow air to be drawn in and exhausted through protected vents in the sides of the stator frame.

The terminal box cable outlet can be set at four positions at intervals of 90 deg, and the screwed conduit gland is detachable. Permanently engraved terminals are provided to save wiring time.

Right : Winding the stator core

Below : The new drip-proof motor



VIEWS on the NEWS

By REFLECTOR

LORD WAVERLEY at last week's dinner of the Association of Consulting Engineers added his voice to those of us who are constantly deploring the misapplication of the appellation "engineer." He said that the term lacked precision, but really the fault lies with those who use it loosely. As Lord Waverley pointed out, anybody from a member of a chartered institution to a member of the Amalgamated Engineering Union may be called an engineer nowadays. It is not mere technical snobbery to protest against the misapplication of the term; the skilled craftsman may be recognised to be as good a man as he who has been trained at a higher technical level. It is perhaps appropriate to recall that in the early days of the electric telegraph the term "electrician" denoted one who was thoroughly technically qualified and the Electrician of the General Post Office was the leader of his profession. The name was handed on to the electrical pioneers but then it gradually came to be applied to the rank and file and the "upper classes" adopted the style of "electrical engineers." Now electricians are usurping the title: what is the next step?

* * *

Speaking at the annual dinner of the South Staffordshire Branch of the Electrical Contractors' Association, the Mayor of Wolverhampton is reported to have said:—

> "To the ordinary person electricity is still a whirlpool of dangerous currents, but actually electrical power was now a trustworthy and reliable servant. Lately it had been introduced as a fuel in the Clean Air campaign."

Surely one of the members present should have explained to His Worship that electrical power has been a trustworthy and reliable servant (if properly installed) and has been helping to clean the air for a great many years now.

* * *

Reports of two electrical accidents in an overseas journal show the efficacy of artificial respiration when applied without loss of time. In one case a locomotive assistant who came into contact with the live 1,500 V overhead traction line when he climbed on top of a locomotive tender undoubtedly owes his life to the fact that treatment began immediately (the Holger Nielsen method was used) with the result that in 15 minutes he regained consciousness. Even more remarkable is the case of an electrical fitter who received an 11 kV shock which threw him from the top of an 8ft voltage regulating transformer. The report states: "Artificial respiration was immediately commenced and after several minutes the injured man resumed breathing."

* * *

In his Graham Clark Lecture delivered recently at a meeting of members of the three leading engineering institutions (which was dealt with in the *Electrical Review* of 15th February) Sir Ifor Evans, Provost of University College, London, spoke of the place of engineering in university education. One or two of his incidental remarks on this occasion are worthy of reproduction. For instance, when suggesting that the necessary development of engineering departments in the universities may have come too late, Sir Ifor said:—

> "We have in this, as in other matters, to pay the price of past neglect, and the situation cannot be adjusted overnight by the agitated debates of politicians fluttering like frightened birds in the wind of their own rhetoric."

Another instance was his quotation from a contemporary record of what happened in 1833 when a proposal was made for the establishment of an Engineering Chair in the University of London:—

> "It provoked a protest from the Professor of Natural Philosophy, who regarded it as an invasion of his province and a menace to his salary."

* * *

Fifty years ago London was supplied with electricity by numerous municipal and company undertakings, some of whose areas overlapped one another. In the *Electrical Review* of 1st March, 1907, alone there were reports by six London supply companies—the County of London Electric Supply Co., the London Electric Supply Corporation, the Westminster Electric Supply Corporation, the Charing Cross, West End and City Electric Supply Co., the Notting Hill Electric Lighting Co. and the Metropolitan Electric Supply Co. In the face of pressure from outside these companies were already beginning to discuss banding together. For example, at the Westminster Company's meeting Mr. Edmund Boulnois spoke of the heavy legal expenses which the companies had been put to owing to attacks by the L.C.C. To combat an attempt by this powerful body to become the sole suppliers of electricity in bulk, not only in the administrative county itself but in surrounding areas, the supply companies, he said, had promoted a Bill to enable them to help one another in the matter of bulk supply. Eventually the London Power Company was formed for this purpose and some years later the distribution side was rationalised by the merging of a number of the supply company undertakings in London Associated Electricity Undertakings, Ltd.

* * *

As a footnote to the above, I was amused to read the following rather plaintive paragraph by the editors in the same issue:—

> "As we go to press with our last pages our electric light has gradually faded away. First the Nernst ceased to glow at 12.10; the carbon lamps maintained a feeble glimmer for half an hour longer and then gave up the ghost. We are now writing by the light of a tallow candle, stuck on a cocoa tin. We thought the Charing Cross Co. welcomed foggy days! Our neighbours on the City Co.'s mains are more fortunate."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. P. E. Wheatland, of the General Electric Co., Ltd., has been elected chairman of the Accessories Section of the British Electrical & Allied Manufacturers' Association, and **Mr. H. P. Sale** (M.K. Electric, Ltd.) has been elected vice-chairman. Mr. Wheatland has also been elected chairman of the Association of Manufacturers of Electric Wiring Accessories, with **Mr. J. A. C. Kendle** (Edison Swan Electric Co., Ltd.) as vice-chairman.

Marconi's Wireless Telegraph Co., Ltd., has created two new posts on the aeronautical engineering staff. **Mr. G. P. Parker,** A.M.I.E.E., has been appointed deputy chief air radio engineer (development); he will undertake the responsibility for the airborne and ground development group of the Aeronautical Division. **Mr. J. H. Gill** has been appointed deputy chief air radio engineer (projects), and will be

Mr. G. P. Parker

Mr. J. H. Gill

responsible for airborne and ground installation projects. Both Mr. Parker and Mr. Gill will be responsible to **Mr. B. J. O'Kane,** Ph.D., B.Eng., A.M.I.E.E., chief air radio engineer.

In addition, the following appointments have been made on the engineering sales staff:—**Messrs. B. J. Infield,** M.A., technical representative (overseas), **E. Swinney,** M.I.E.E., technical representative (home), and **E. Hird,** technical representative in the United States.

Mr. S. H. Lines, M.B.E., has been appointed to the board of Cossor Instruments, Ltd. **Mr. H. T. Shepherd** has retired from the board on his appointment as managing director of Best Products, Ltd., the Cossor subsidiary manufacturing domestic electrical equipment.

Mr. H. Stanesby, M.I.E.E., of the Post Office Engineering Department, has been invited to give a lecture on radio-relay systems to the Nederlands Radiogenootschap (Netherlands Society of Radio Engineers) at The Hague on 5th March. Mr. Stanesby, who is a past chairman of the Radio and Telecommunications Section of the Institution of Electrical Engineers and is in charge of the Radio Planning and Provision Branch of the Post Office Engineering Department, is chairman of Study Group IX of the Comité Consultatif International des Radiocommunications—the study group concerned with formulating international regulations on the characteristics of radio-relay systems.

Mr. R. M. Malloch, works manager, has been co-opted to the board of Allen West & Co., Ltd.

Mr. G. Anthony Hepworth, a director of Hepworth & Grandage, Ltd., has been elected to the board of Associated Engineering (Sales), Ltd., to fill the vacancy caused by the death of his father, the late Mr. Elijah Hepworth.

Mr. K. L. Harris, Ekco sales representative for Devon and Cornwall, has been appointed sales office manager of Ferranti Radio & Television, Ltd., which commences operation after 31st March. The new Ekco representative for the area is **Mr. E. R. Barham,** from the head office staff of E. K. Cole, Ltd.

The following changes are being made in the head office radio and television sales staff of E. K. Cole, Ltd., following Mr. R. A. Drummond's appointment as sales manager of Ferranti Radio & Television, Ltd. **Mr. R. S. Underwood** is to become assistant sales manager for both north and south. The two new posts of northern area manager and southern area manager are to be taken up by **Mr. W. F. Valentine,** Ekco representative for the Birmingham area, and **Mr. A. J. Godfrey,** of head office, respectively.

Mr. A. J. Nicholas, joint managing director of Aberdare Cables, Ltd., and managing director of South Wales Switchgear, Ltd., left on 16th February on a brief visit to Canada, the United States and other parts of America. He expects to be out of the country for about three weeks.

Mr. F. G. Cook, commercial manager, Marconi Instruments, Ltd., will leave for New York on 8th March on a three weeks' visit, during which he will attend the I.R.E. National Show at which the company is exhibiting.

Lord Clitheroe, P.C., has joined the board of Tube Investments, Ltd.

Mr. R. G. F. Griffin has been appointed manager, overseas manufacturing, of F. Perkins, Ltd., in succession to **Mr. D. V. Prior.** Mr. Griffin will also continue for the time being in his present position of personal assistant (forward planning) to the deputy managing director.

Mr. W. R. Edwards, M.I.Mech.E., has retired from the position of managing director of John Thompson Water Tube Boilers, Ltd., after over fifty years of service with the John Thompson group. For the time being he is continuing with the group in a consultative capacity.

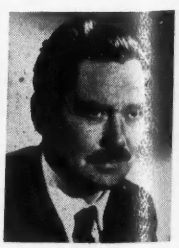
Mr. C. J. Howard

Mr. C. J. Howard has been appointed managing director of John Thompson Water Tube Boilers, Ltd. He has been with the company for thirty-one years, and for the last twenty years he has been London manager and director.

The Metropolitan-Vickers Electrical Co., Ltd., has appointed **Mr. A. O. Ahlquist,** M.A., A.M.I.Mech.E., as assistant sales manager, Mechanical Department, and **Mr. N. J. Austin,** M.C., A.M.I.Mech.E., A.M.I.M.E., as assistant to the sales manager, Mechanical Department.

Mr. Ahlquist, after taking his degree at Cambridge, joined the company in 1941 as a college apprentice. For the six years following his apprenticeship he was concerned with the company's gas turbine activities—from 1942 to 1945 in the Gas Turbine Engineering Department, 1945 to 1947 in charge of research, development and testing of aircraft engines at the company's Northwich plant, and 1947 to 1948 as sales engineer in the Gas Turbine Department. After a shorter period in the Steam Turbine Engineering Department, Mr. Ahlquist was transferred in 1949 to the M-V Export Co. in London. He returned to the M-V Trafford Park Works in 1950 as sales engineer in the Mechanical Sales Department, and in 1951 was

Mr. A. O. Ahlquist

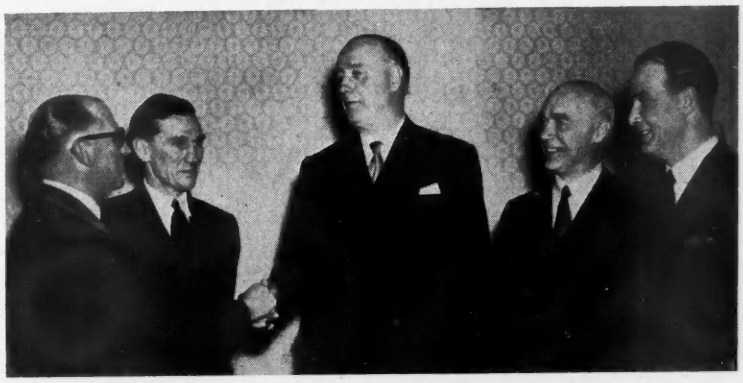


Mr. N. J. Austin

appointed assistant to the sales manager (large turbines), Mechanical Department.

Mr. Austin, following his technical education at the Polytechnic, London, joined the company in 1938 as a college apprentice. On completion of his apprenticeship course he joined the Mechanical Sales Department, and he has continued in that department except for war service. He served with the Royal Engineers from 1942 to 1947.

The annual dinner of the **Ipswich and District Electrical Association,** held at the Great White Horse Hotel, Ipswich, on Friday last, was attended by over 200 members and guests, including several well-known personalities in the electrical industry. Some of the principal guests are shown in the accompanying photograph.



At the annual dinner of the Ipswich and District Electrical Association. Left to right : Mr. H. P. Thompson (chairman), Capt. R. D. Franks (Officer Commanding H.M.S. "Ganges"), Sir Henry Self (deputy chairman (administration), C.E.A.), Mr. C. T. Melling (chairman, Eastern Electricity Board) and Mr. A. W. Hardie (Shell-Mex and B.P., Ltd.)

The Sheffield Branch of the **Electrical Industries Benevolent Association** is holding its annual dinner and dance at the Royal Victoria Station Hotel, Sheffield, on Friday, 15th March. Mr. A. Haddock, B.Sc., M.I.E.E., will be in the chair and among those present will be the Lord Mayor and Lady Mayoress and the president of the E.I.B.A. (Mr. Harry Riley) and Mrs. Riley. Both the Lord Mayor (Ald. R. Neill) and Mr. Riley are well-known electrical wholesalers in Sheffield.

The North Staffordshire Branch of the Association is to hold a buffet-dance on 4th April at the North Stafford Hotel, Stoke-on-Trent.

Mr. G. R. Peterson, B.A., M.I.E.E., M.I.Mech.E., generation operation engineer of the Central Electricity Authority, has been appointed deputy chief engineer (generation and system operation). A graduate of Clare College, Cambridge, Mr. Peterson had a varied training experience in Britain before going to the United States in 1930 where he spent fifteen months in the test department of the American General Electric Co. On his return to Britain he joined the Metropolitan-Vickers Electrical Co., Ltd., and subsequently joined the Central Electricity Board as an assistant in the Operation Department of the North-East England Area. He was seconded to the Ministry of Economic Warfare in 1943 for work on Continental electricity supply systems and on returning to the Board was appointed principal assistant operation engineer at its headquarters in London. In 1946 he became operation engineer for the North-West England and North Wales Area. On the establishment of the Authority in 1948 he was appointed personal assistant to the deputy chairman (operations) with special responsibility for overseas liaison and later became technical executive assistant to the deputy chairman (operations). He took up his present post in 1951.

Mr. G. R. Peterson

Mr. V. F. H. Green has been appointed sales promotion manager of N.S.F., Ltd., to take over the publicity activities of the company. Before joining N.S.F. Mr. Green was with the B.I.C.C. group for nearly twenty years, part of which was spent at the research laboratory, and latterly with the T.C.C.

Sir Claude D. Gibb, managing director of C. A. Parsons & Co., Ltd., has been elected chairman of the governors of the new Rutherford College of Technology, Newcastle-on-Tyne.

Mr. E. L. Pearce, A.I.E.E., A.Inst.F., station superintendent at Norwich generating station, Eastern Division, C.E.A., has been appointed station superintendent, South Denes (Great Yarmouth), and commences his new duties to-day (Friday). Mr. Pearce commenced his service in the industry with Barnstaple Corporation in 1922, being appointed station superintendent at Watford in September, 1950, and to his present position at Norwich in November, 1953.

Mr. G. H. L. Stonehouse, M.I.Mar.E., deputy station superintendent at Norwich, has been promoted station superintendent there. Mr. Stonehouse commenced his service in the industry with Hull Corporation in 1933, and was appointed to his present position at Norwich in March, 1953.

Mr. E. L. Pearce

Mr. G. H. L. Stonehouse

Mr. J. D. Akers, Mr. J. McKenzie and **Mr. J. Clemow** have been appointed to the board of Electrolube, Ltd.

Mr. K. Collins, formerly of Egen Electric, Ltd., has joined A. B. Metal Products, Ltd., as sales manager of the company. **Mr. L. Woolf** is taking up another appointment with the company.

Mr. K. Collins

A regimental reunion dinner is being held at the Tavistock Banqueting Rooms, Charing Cross Road, London, W.C.2, on Saturday, 27th April, to celebrate the diamond jubilee of the **London Electrical Engineers.** Further particulars may be obtained from the hon. organising secretary, Mr. L. Pugh, 14, Ribblesdale Road, London, S.W.16.

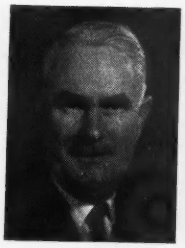
At the annual meeting of the **Exeter Electric Club** held at the Imperial Hotel on 21st February, Mr. F. C. Isaac, A.M.I.E.E. (Lt.-Commander, R.N.V.R.), a member of the Plymouth Electric Club, gave an address on "Reminiscences Above and Below the Waves." Mr. W. Hallam (vice-president of the Club) was in the chair.

The Midlands area final of the **Electrical Industries National Golf Competition** is to be held at Edgbaston Golf Club on 26th June next. Particulars can be obtained from Mr. A. R. A. Wood, 100, Aston Road, Birmingham, 6 (telephone: Aston 2591).

The Marconi International Marine Communication Co., Ltd., announces that **Mr. G. H. W. Johnson,** who until 31st January was manager of the Fishing Industry Branch of the company's

Contracts Division, has been placed in charge of the marine business of Marconi (South Africa), Ltd.

Mr. C. L. Caiger, of the car radio sales division of E. K. Cole, Ltd., is leaving for Australia this month. He will become general manager of Ediswan-Ekco (Aust.) Pty., Ltd., Sydney, a company jointly owned by Associated Electrical Industries, Ltd., and E. K. Cole, Ltd. On taking up



Mr. C. L. Caiger

Mr. R. G. Atkinson

his duties he will be appointed to that board. **Mr. R. G. Atkinson,** who has been with the Ekco car radio sales division for the past eight years, is taking over Mr. Caiger's responsibilities as assistant sales manager, car radio.

Mr. J. T. Rook has been appointed sales personnel manager of Hoover, Ltd. Mr. Rook has been with the company since 1946 and has latterly been a manager in the sales personnel department. **Mr. E. A. Barrow,** until recently an area manager with the company in the Leicester district, has been promoted to district manager at Liverpool.

Mr. G. Cooke has been appointed advertising and publicity director of the Solartron Electronic Group, Ltd., having been elected a director of Solartron Laboratory Instruments, Ltd.

On 8th February six employees of **M.K. Electric, Ltd.,** who had completed twenty-five years' service with the company were presented with gold watches by Mr. C. L. Arnold, founder director and general manager.

Dr. D. H. Follett has been appointed Keeper of the Department of Electrical Engineering and Communications at the Science Museum, South Kensington, in succession to **Mr. F. St.A. Hartley,** who has retired.

OBITUARY

Mr. John Dean, a co-director with Mr. R. Cutts, of Deans Electrical & Engineering Co., Ltd., died on 19th February.

Mr. E. S. Hoare.—The death has occurred of Mr. Edwin S. Hoare, M.C., B.Sc., A.C.G.I., M.I.C.E., A.M.I.E.E., for many years senior partner of Hoare, Lea & Partners, consulting engineers, and more recently the firm's consultant.

Helium Dryer for Nuclear Reactor

For the "Dido" research reactor at Harwell, which uses highly enriched uranium fuel cooled and moderated by heavy water, British Oxygen Engineering, Ltd., have supplied a helium dryer and adsorber to a stringent specification. If the hydrogen and oxygen resulting from the splitting up of the heavy water by radiation were allowed to accumulate an explosive atmosphere could be produced in the reactor, so to remove these unwanted gases and any possible air inleak helium is employed in a closed circuit, which means that the helium itself has to be purified. On the principle that the lower the temperature the greater the adsorbent capacity, the method adopted has been to cool the helium down to the boiling point of liquid nitrogen (— 196 deg C) and then to pass it over a special type of active charcoal. The radioactive helium emerges from the reactor at around ambient temperature and is pre-cooled in an aluminium-sheathed heat-exchanger through which the purified gas is passed on its way back into the reactor.

From the heat-exchanger the helium then passes to the liquid nitrogen cooler which, together with the adsorber, is encased in a stainless steel cylinder. The adsorber is arranged in tandem for batch operation, only one section being used at a time. Periodically the charcoal in each section in turn has to be regenerated.

Since radioactive materials are involved the entire plant, which measures approximately 5ft 6in by 4ft by 10in, must be absolutely free from the risk of leaks. Hence the welding technique used in the construction had to be of the very highest quality and the plant was subjected to very stringent tests before being brought into operation. Further, transportable leak-detectors are used regularly to ensure that the plant remains completely gas-tight.

"ELECTRICAL WHO'S WHO"

The 1956-57 edition of the "Electrical Who's Who," which is available from Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, has been considerably enlarged and contains some 7,000 entries in addition to an index in which names in the biographical section are classified under companies and other organisations. The price remains at 21s. (postage 1s 5d)

Electrical Contractors' Conference

The provisional programme has been issued for the annual conference of the Electrical Contractors' Association and Allied Associations at Llandudno from 26th to 28th May. On the first day (Sunday) delegates will register at the Grand Hotel and in the evening there will be a "Get Together," with light refreshments and music.

The Monday proceedings will begin with a civic welcome and the presidential address, by Mr. A. V. Milton, will follow. Then Mr. V. J. Stock (vice-president) will present a paper entitled "Electrical Contracting—Science or Guesswork?" There will be a garden party in the afternoon and a reception by the president in the evening.

On the Tuesday morning the annual general meeting will be held and the afternoon will be devoted to an "Any Answers Please" session, with a representative panel, and the new president will then be installed and will give a short address. The conference ends with a reception by the chairman of the Llandudno U.D.C. in the evening.

British Plastics Year Book

The 1957 edition of the British Plastics Year Book is bound in a plastics case. It has been thoroughly revised and, as before, is divided into nine sections, three of which are devoted to classified lists of manufacturers and suppliers of materials, finished products, and equipment. Another section contains a list of trade and proprietary names connected with the industry, and covers materials as well as finished products. Each trade name is followed by a definition of the product, the manufacturer concerned, and the country of origin when the manufacturer is overseas. A glossary of technical terms used in plastics is again included in this section of the Year Book.

The names and addresses of nearly 4,000 firms associated with plastics are grouped into countries in the names and addresses section. In addition, the "Who's Who" section gives names and positions of prominent people actively engaged in the industry in Great Britain.

One of the most important features of the Year Book is the annual review of plastics patents. This section of 142 pages contains all relevant patents issued last year. There are also lists of the new plastics companies registered in 1956 and British Standard Specifications relating to the plastics industry.

The Year Book is published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1., price 42s net (postage 1s 9d).

PARLIAMENTARY REPORT

Restrictive Trade Practices Register

In the House of Commons last week Mr. Jay asked the President of the Board of Trade whether the Register of Restrictive Trade Practices was yet open to inspection by the public.

Mr. Walker-Smith, Minister of State, said he understood that after the close of the first registration period on 28th February the Registrar would need a little time in which to examine and classify the information sent to him before he opened the Register.

Mr. Jay said that members of the public who had recently called on the Registrar had been told that no single agreement had yet been put on the Register. As it was now six months since the Act was passed, did that not bear out the fears of the Opposition that the whole of this procedure would be too slow?

Mr. Walker-Smith replied that if what was said was true it was gratifying confirmation that a number of restrictive practices were in the course of being abandoned or revised.

Report on Valve Industry

Mr. Arthur Lewis asked the President of the Board of Trade what action he proposed to take on the Monopolies Commission Report on the Radio Valve and Electronic Tube Industry.

Mr. Walker-Smith said the Commission were asked to report on the facts only and they therefore reached no conclusions on the effects of any of the industry's arrangements on the public interest. There was no provision for action under the 1948 Monopolies Act.

Mr. Rankin said that one of the facts shown in the report was that a 14in cathode-ray replacement tube cost £5 6s 1d to make and £20 to buy. What was it proposed to do about that?

Mr. Walker-Smith said the report showed that the profit made on the replacements was a good deal larger than that made on tubes supplied to the set makers. The average profit referred to fell from 17 per cent in 1954 to 10 per cent in 1955.

Atomic Energy Commission

Mr. Hector Hughes asked the Paymaster-General whether the present terms of reference of the Atomic Energy Commission were sufficiently extensive to include all forms of nuclear fission and fusion.

Mr. Maudling said the powers of the A.E.A. set out in the Atomic Energy Authority Act, 1954, were wide enough to include all the processes mentioned by Mr. Hughes. The Lord President of the Council was satisfied that the Authority's programme, and the arrangements for applying its achievements for the benefit of the nation, were capable of maintaining the advanced position which the United Kingdom had won in the atomic energy field.

Replying to further questions, Mr. Maudling said the terms of reference included the application of nuclear energy to the propulsion of ships. Whilst he knew that much progress on this had been made in the United States, he did not think that the progress made in Britain was negligible.

Thermo-Nuclear Research

Mr. David Price asked the Paymaster-General what progress had been made by the Atomic Energy Authority in the study of nuclear fusion as a practical and economic source of energy.

Mr. Maudling said he was informed by the Atomic Energy Authority that, as stated in the Authority's second annual report, a programme of research into the possibilities of obtaining economic power from controlled thermo-nuclear reactions had been under way since 1948. The work was still in the laboratory stage, and many problems remained to be solved before a practicable fusion reactor would be possible.

Later, in reply to Mr. S. Irving, the Paymaster-General said that the discovery that fusion of hydrogen isotopes could be brought about by mesons had no practical application at the present time because the meson existed for only about a millionth of a second after its formation. Basic information of this sort was normally published in scientific journals and was therefore freely available to British scientists.

Co-ordination of Power Resources

Mr. Atkins asked the Prime Minister whether, in order that the plans for the development of the power resources of this country might be comprehensive, he would introduce legislation to transfer the responsibility for hydro-electric development in Scotland from the Secretary of State for Scotland to the Minister of Power.

Mr. Macmillan said he thought the arrangements made in April, 1955, were generally welcomed by Scottish opinion and were working well.

Asked by Mr. Atkins whether it would not be better if the whole of this important group of activities were under the control of one Minister instead of a small part of the power industry being under the control of a Minister who had many other things to occupy his attention, Mr. Macmillan said that was a matter for argument, but one problem they had to solve was how to ensure the proper degree of co-ordination while taking full account of Scottish national opinion.

Mr. Woodburn pointed out that the North of Scotland Hydro-Electric Board's duties covered much more than the production of electricity, and embraced a responsibility for trying to stimulate the economic development of the Highlands, and Mr. Elliott asked the Prime Minister to think long and seriously before discarding present arrangements, which had been satisfactory.

Mr. Macmillan: "Yes, I think this is one of the most successful operations of the Government in meeting Scottish national opinion without disturbing the principle of co-ordinated control."

Technical Education

Replying to Mr. Hamilton, the Prime Minister said that a separate Ministry of Technical Education would have no advantage over the present arrangements.

Protective Tariffs in Europe

Mr. Usborne asked the President of the Board of Trade if he would list the twelve heaviest in incidence of the British protective tariffs which would need to be progressively reduced following the creation of the European free trade area and the twelve most substantial tariff barriers to our exports which would similarly have to go.

Mr. Walker-Smith, in his reply, said that the *ad valorem* incidence of such duties could vary widely from one importation to the next. Among the items liable to specific or composite rates of duty of which the incidence was sometimes high were arc lamp carbons. As regards tariffs affecting our exports, it was not necessarily the highest duties which prevented the most trade. There were duties in the range of 35 to 40 per cent in countries which were prospective members of a free trade area on, among other goods, vacuum cleaners and other electrical appliances.

Cost of Supply Line Deviations

Quoting the case of four smallholdings at Ascot, Lord Lucas asked in the House of Lords whether it would be possible to reconsider the policy whereby consumers were called upon to pay excess charges when a more expensive route had to be adopted because of military requirements.

The Minister of Power (Lord Mills) said that in any particular case a consumer could make representations to the Electricity Consultative Council and that Council, if it thought fit, could in turn make representations to the Central Electricity Authority and ultimately to the Minister. Speaking generally, however, there were many requirements besides those of military authorities which often led to the adoption of a more expensive route for

an electricity supply line; for example, the requirements of local planning authorities, amenity organisations and land owners. He did not think it would be justifiable to single out for special treatment additional costs arising from military requirements.

Questioned further, Lord Mills agreed that in general the cost of rural electrification should fall on the whole body of consumers. But this was an instance, he said, where an aerodrome had got there first and a more expensive route had to be adopted. This case hardly came within the same class and should be dealt with locally between the Area Board, the County Council and the Consultative Council.

Experimental Peat-Fired Station

Viscount Thurso asked what was the estimated average capital cost per kW installed by the North of Scotland Hydro-Electric Board of the scheme for generating electricity from a peat-fired gas turbine engine.

Lord Strathclyde, Minister of State, said the cost of the experimental power station in Caithness was estimated to be equivalent to £157 per kW. In addition, expenditure on developing the bog was estimated at £51 10s per kW. The average cost of generation including amortisation of the capital cost was 2d—2·3d/kWh.

Holy Island Supply

Mr. Willey asked the Paymaster-General whether he would make a further statement on the inquiry regarding the supply of electricity to Holy Island.

Mr. Maudling said the Minister of Power, after consultation with the Minister of Housing, had decided to give his consent to the scheme proposed by the South of Scotland Electricity Board except for some additional underground cable in the south of the village, and for the section along the approach to the village, where a possible alternative route overhead was being explored.

Electricity Pensions

Mr. Palmer asked the Paymaster-General if he would make a statement on the reasons for not approving the comprehensive scheme for pension improvements in the electricity supply industry submitted by the Central Electricity Authority last autumn, and the approval instead of only a partial improvement limited to ex-local authority pensioners.

Mr. Maudling replied that the Minister of Power had approved the pension increases for ex-municipal employees in the industry because they would have benefited under the Pensions (Increase) Act, 1956, if the industry had not been nationalised. No such consideration affected the position of ex-company pensioners in the industry.

Storm Damage in Ulster

Mr. Thompson, Assistant Postmaster-General, told Captain Orr that the storm which occurred in Northern Ireland on 25th/26th December cut off 9,000 subscribers and 68 telephone exchanges. These services were restored within about three weeks at a cost of £60,000 and permanent repairs would cost a further £60,000. A further storm on 4th February cut off 2,500 subscribers and 36 exchanges. Most of these had already been reconnected and the total cost was likely to be about £15,000. The cost of repairing storm damage was not itself chargeable to capital but account is taken of the leeway in normal work when making capital allocations.

Patents Bill

When the Patents Bill was considered in committee Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade, moved an amendment to delete sub-section (2) of Clause 1. He said this would have the effect of leaving Section 13 of the Patents Act, 1949, unamended. Therefore, although under other provisions in this Bill an applicant for a patent would have a longer period than was allowed in the 1949 Act for putting his patent specifications in order for acceptance, he would not be able to request the postponement of the acceptance for a longer period than the maximum 15 months. The Government had decided to make this change in view of the wide representations they had received, but they did not think it would have much practical effect in respect of those who were determined to resist the completion of their specifications. The Government offered the amendment in the hope that it would do something towards preventing delay.

Sir F. Soskice said the change would prevent what otherwise would have been a substantial abuse and prolongation of the proceedings.

Mr. C. Fletcher-Cooke said that it would be a substantial advantage.

Area Boards' Tax Payments

In Committee of Ways and Means, Mr. Powell, Financial Secretary to the Treasury, moved a resolution to correct a defect in the Electricity Bill. He said that as the law now stood the C.E.A. was responsible for paying income tax and profits tax for the whole industry and had powers under the 1947 Act of recovering the tax from the Area Boards. The Electricity Bill placed the Generating Board in this respect in the place of the C.E.A., but it repealed the powers to recoup from the Area Boards. That would clearly result in an impossible position. The sensible solution, obviously, was to enable the new Electricity Council to step into the shoes of the old C.E.A. with similar obligations in respect of tax and with the same powers of recoupment. This resolution would enable the Standing Committee now considering the Bill to make an amendment accordingly.

Sir Frank Soskice said the resolution treated the Council as if it would be carrying on a trade or business, but it was not clear that it would have the same power of recoupment that the C.E.A. had. The Opposition would like to be assured that the Council, which, so far as they could see was wholly deprived of income and completely stripped of any possibility of earning income, was given the necessary power.

Customs Duties Bill

When the Customs Duties (Dumping and Subsidies) Bill was further considered in committee the House of Commons agreed to an amendment which makes it clear that foreign goods shall be regarded as subsidised goods if any subsidy or bounty is given in the foreign country in the production and export of the goods "whether by grant, loan, tax relief or in any other way, and whether related directly to the goods themselves, to materials of the goods or something else." Another amendment makes the Bill conform with the obligation under the General Agreement on Tariffs and Trade that one of the tests for putting on an anti-dumping duty should be that material damage was done, or was threatened, to an established source of supply.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £241 0s 0d
Fire Refined 99·7%	ton £240 0s 0d
Fire Refined 99·50%	ton £239 0s 0d
COPPER Tubes ..	lb 2s 4½d
Sheet	ton —
H.C. wire and strip ..	ton £295 5s 0d
LEAD, English ..	ton £112 15s 0d
Foreign	ton £111 0s 0d
MERCURY	flask £85 15s 0d
TIN, block (English) ..	ton £755 0s 0d
ZINC, G.O.B. Foreign	ton £97 0s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 11½d
Sheet	ton —
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 3s 11½d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 25⅝d—25½d

Scientific Management Congress

The eleventh International Management Congress to be held by the International Committee for Scientific Management will take place in Paris from 24th to 28th June. The Committee is represented in Great Britain by the British Institute of Management, 8, Hill Street, London, W.1, from which further particulars can be obtained.

SUPPLY OF ELECTRICAL PLANT

Monopolies Commission's Report

IN April, 1952, the President of the Board of Trade referred to the Monopolies & Restrictive Practices Commission for investigation and report the supply and export of certain electrical and allied machinery and plant. This reference was subsequently amended, in February, 1953. The products to which the terms of reference applied were as follows:—

(*a*) Alternators of not less than 300 kW m.c.r. designed to be driven by turbines; and steam turbines (including condensing and feed-water heating equipment for them) and hydraulic turbines for driving such alternators.

(*b*) Other alternators of not less than 10 kVA rated outputs; d.c. generators of output not less than ·75 kW per 1,000 r.p.m. and of not less than ·75 kW actual rating; a.c. motors of not less than 1 h.p.; and d.c. electric motors of output equal to not less than 1 h.p. per 1,000 r.p.m. and of not less than 1 h.p. actual rating.

(*c*) Transformers of not less than 5 kVA rated output.

The Commission's report was published last Friday (No. 42, H.M. Stationery Office, 11s 6d). In consists of 353 pages, including 14 appendices, and we summarise below the principal points.

From the 1951 Census of Industry the Commission found the total gross output of the electrical industry in that year to be £726·6 million, including "electrical engineering (general)" £363 million. Of the latter figure £70 million was attributed to machinery within the terms of reference, but not all of it was included. In 1952 net sales of machinery in the three classes specified were as follows (in £ million), export values being shown in parentheses:—(*a*) £23·273 (£11·942); (*b*) £41·780 (£10·374); (*c*) £22·812 (£9·282); total £87·865 (£31·598). Comment is made by the Commission on the great variation in manufacturing and selling conditions as between, e.g., a 1 h.p. motor and a 200 MW turbo-alternator set.

Wide Range of Interests

A large number of manufacturers produce the machinery within the reference; these vary in size and range of interests. Special mention is made of the British Thomson-Houston Co., the Metropolitan-Vickers Electrical Co., the English Electric Co., the General Electric Co., and C. A. Parsons & Co. Most manufacturers of machinery within the reference are members of the British Electrical and Allied Manufacturers' Association which, it is pointed out, is not concerned with the commercial policy of its members. There are, however, two other organisations (to which most of the manufacturers concerned belong)—the Trade Groups and the International Electrical Association (I.E.A.) which both operate agreements on prices and other matters.

After a paragraph on materials and manufacturing processes, the Commission deals with markets and buyers. It says that in 1952 78·5 per cent of the Class (*a*) machinery supplied in the home market went to the Central Electricity Authority and 66 per cent of that in Class (*c*) to the C.E.A. and Electricity Boards. There was no predominant buyer of Class (*b*) machinery. Imports of these classes since 1932 have not amounted to more than 2·5 per cent of home purchases. The shares of British, American and German electrical manufacturers in overseas trade are given in an appendix.

Reference is made to the Heavy Electrical Plant Committee, formed in 1944 by the Ministry of Fuel and Power for the purpose of agreeing post-war programmes for the then Central Electricity Board, which was later reconstituted as the Heavy Electrical Plant Consultative Council. It is noted that the Council has not met since July, 1955, when responsibility for the industry was transferred to the Board of Trade. Directives to the industry by the Government regarding the relative priorities of home and export orders are mentioned.

Formation of the B.E.A.M.A.

On the subject of research the work of the Electrical Research Association (initiated by the B.E.A.M.A.) and that of individual manufacturers is referred to and this is followed by notes on standardisation and the development of the electrical industry. It is recalled that in the earlier part of this century British electrical manufacturers were threatened by foreign competition and price cutting and formed the National Electrical Manufacturers' Association, which in 1911, with a revised constitution, became the B.E.A.M.A. Before the 1914-18 war a number of Trade Groups were established by manufacturers concerned with particular types of heavy machinery. Generally, it is said, while the B.E.A.M.A. is concerned with representing the views of its members on matters of general interest to the industry, including conditions of contract, the Groups' main object is the regulation of prices.

The organisation and objects of the B.E.A.M.A. are given a separate chapter and it is stated that of some 400 members 58 concerns make machinery and plant covered by the inquiry. Emphasis is laid on financial soundness and high standards in the admission of firms to membership. In 1953 the B.E.A.M.A. had a total income of £200,178 of which £199,997 was expended, mainly on administration, though a sum of £30,607 was allocated to research and other bodies. The report indicates the wide scope of the B.E.A.M.A.'s activities in matters concerning the electrical industry generally.

It is shown that the Trade Groups operate 37 agreements in the field investigated by the Commission. There are practically no United Kingdom manufacturers of Class (*a*) machinery who are not members of the appropriate Groups, although it is stated that one large manufacturer does not subscribe to all Group arrangements and another company making steam condensing plant is not now a member of the Condenser Group or the Condenser Section of the B.E.A.M.A. Not all manufacturers of Classes (*b*) and (*c*) equipment are Group members.

Broadly the Group agreements are on similar lines to those of the I.E.A. referred to below. They nearly all have as their expressed objects co-operation for the good of the industry and the public, the encouragement of research and development, the establishment of reasonable conditions of contract, and the study of, and co-operation in meeting, market requirements; those agreements which include price arrangements also include among their objects that of stabilising prices at a "reasonable and economic" or "competitive" level.

The arrangements for compensation apply only to

Class (*a*) and the larger machinery in Class (*b*). The Groups have no arrangements for common minimum prices or compensation in relation to exports of the larger Class (*a*) machinery and plant nor have they any arrangements relating to exports of certain large specialised machines in Class (*b*); arrangements for other large machines in Class (*b*) apply only to "indirect" exports. There are provisions for penalties against members who infringe common minimum price arrangements and for the expulsion of members in certain circumstances.

Although the B.E.A.M.A. provides accommodation and secretarial services to the Groups, the Association emphasised in its evidence that the Groups are autonomous bodies and that they do not receive recommendations on policy from or come under the control of the B.E.A.M.A. Council. While accepting the B.E.A.M.A.'s statement that it is not itself concerned with the operation of the agreements, the Commission cites occasions on which the Association has been indirectly concerned with some aspects of these arrangements.

International Agreements

The Report, dealing with conditions prevailing between the wars, refers to discussions between some British, American, German and Swiss manufacturers leading to an International Notification and Compensation Agreement. In 1934 this agreement was superseded by the International Electrical Association. The I.E.A. has sixteen sections concerned with particular types and ranges of machinery twelve of which cover machinery within the Commission's terms of reference. The agreements are subscribed to by most British and foreign manufacturers. They provide for the central notification of inquiries and orders received and for circulation of specified information to other notifying or tendering signatories, as appropriate. The Commission says that whether or not the notification of an inquiry leads to other forms of joint action it was told that it is of value to signatories in that it gives "mutual knowledge as to who your competitors are."

There were compensation agreements by which a successful signatory paid a sum for distribution among the other tendering signatories but these were suspended in 1942 on account of currency difficulties and have since lapsed. It is possible that foreign members may wish to reintroduce such arrangements. Meanwhile a modified form of compensation is still operated between British members of the I.E.A. for certain types of machinery for which those members also agree common minimum prices.

The British members have told the Commission that where price arrangements are operated their primary object is to obtain fair prices by eliminating competition among British manufacturers as far as possible; where British manufacturers meet competition from other manufacturers the price level is arranged to meet that competition while still avoiding competition among themselves. From time to time members of the I.E.A. have placed one or more of their number in a favourable competitive position by quoting higher prices or less favourable terms or by refraining from quoting. This has not been related to wider quota or market sharing arrangements: it may or may not be linked to common minimum price arrangements.

The I.E.A.'s interests cover all markets of the world. The domestic market of British manufacturers is excluded from its various agreements and arrangements but this carries with it no undertaking that members of other nationalities will refrain from quoting or have regard to the home manufacturers' price levels.

For some years during and after the war the membership of the Association consisted almost exclusively of British manufacturers but more recently a number of foreign manufacturers have again joined. It is believed that Continental firms would like to revive the former "compensation" arrangements and that there is likely to be an increase in the frequency of requests for "protection" arrangements.

Contract Conditions

Contract conditions drawn up by the B.E.A.M.A. are dealt with in some detail, with parallel reference to the similar I.E.E. conditions. These were said to be formerly a "nominal" obligation on B.E.A.M.A. members but now the Association *recommends* the use of standard conditions. In some cases, however, some form of the conditions is obligatory upon Group members. Similar considerations apply in the case of the supplementary contract price adjustment arrangements. In this connection some comment is made on the imposition of unreasonable terms upon manufacturers by some purchasers.

Part II of the Report deals in detail with Class (*a*) plant and machinery. Figures showing the "pattern of trade" go only up to 1952; they show the predominance of the C.E.A. among the purchasers (78·5 per cent).

The proportions of the total net sales of the five principal manufacturers are given in a table part of which is reproduced.

Manufacturers	1952		
	Home	Export	Total
	Per cent	Per cent	Per cent
British Thomson-Houston Co., Ltd.	9·3	13·8	11·6
Metropolitan-Vickers Electrical Co., Ltd. ...	29·5	21·0	25·1
English Electric Co., Ltd.	19·4	24·6	22·0
General Electric Co., Ltd.	8·2	5·1	6·6
C. A. Parsons & Co., Ltd.	22·4	20·6	21·5
Total	88·8	85·1	86·8

This section deals with the Group's relations with the I.E.A., home and export market price arrangements and prices to the Central Electricity Authority in which details are given of the Authority's separate negotiations with C. A. Parsons & Co. after that company had withdrawn from the price agreements covering large machinery in the home market. Handling charges and intercontracting arrangements are reviewed and there are chapters on marine equipment and hydro-electric machinery. Following this there are notes on arrangements of individual manufacturers of Class (*a*) machinery.

Part III is devoted to Class (*b*) machinery. It is said that in 1952 98 per cent of the total sales were made by 59 manufacturers whose names are given. Particulars of Group and I.E.A. agreements are set out and the nature and scope of home and export price arrangements are stated with some comments on differential prices. There is conflicting evidence regarding the prices and quality of the products of non-Group manufacturers who, the Commission says, do not on the whole cater for as wide a range of needs as Group manufacturers.

Transformers (Class (*c*)) are the subject of Part IV in which there is a brief dissertation upon the use of cold-rolled directional steel. There are some 80 known manufacturers of Class (*c*) transformers but only 25 had an output valued at over £100,000 in 1952. In that year 82 per cent of the total trade was transacted by 16 manufacturers who were either signatories of Group agreements or co-operated with signatories. Here again particulars of agreements are given and a chapter is devoted to prices to the C.E.A. and Electricity Boards who between them accounted for two-thirds of the home sales in 1952.

Saying that although its conclusions are based on 1952

figures the Commission finds that in the terms of the 1948 Monopolies Act:—

(i) The conditions prevail as regards the supply of machinery in each of Classes (*a*), (*b*) and (*c*), because in each case the manufacturers who are parties to Group arrangements which restrict competition supply more than one-third, by value, of the machinery in the respective class which is supplied in the United Kingdom.

(ii) The conditions also prevail as regards the supply of machinery in Class (*a*) because the Metropolitan-Vickers Electrical Co., Ltd., and the British Thomson-Houston Co., Ltd., which as subsidiaries of Associated Electrical Industries, Ltd. (A.E.I.) and, therefore, "interconnected bodies corporate," supply more than one-third, by value, of the machinery in that class which is supplied in the United Kingdom.

(iii) The conditions also prevail as regards the supply of machinery in Class (*a*) because more than one-third, by value, of the machinery in that class which is supplied in the United Kingdom is supplied to one "person," the Central Electricity Authority (C.E.A.). This does not apply in the case of Class (*c*).

Prices and Costs

The report goes in some detail into prices, costs and profits. It gives an analysis showing the wide range of costs for individual items and cost increases of various types of Class (*a*) plant since 1951 are tabulated. In response to criticisms the manufacturers have mentioned the difficulties in costing created by the absence of published price indexes for the main components. They maintain that although the methods may be unscientific the result is not unreasonable because the average profits achieved are reasonable.

In the case of small motors and alternators (Class (*b*)) the Commission criticises the manufacturers' methods of determining common minimum prices. The manufacturers' reply indicates that they endeavour to arrive at prices which will give reasonable profits and be competitive with non-members' prices; their final criterion is what is expedient in relation to market conditions.

Transformer costs are studied in the light of formulæ for determining price changes and the profit rates on various sizes related to highest and lowest costs are shown. Similar figures are given for other plant and the conclusion is arrived at that rates of profit earned by individual manufacturers vary very widely. This is explained by the Groups as being the outcome of the fact that the heavy electrical industry is one in which mass production cannot generally be practised and, in the conditions, costs and profits are certain to vary widely from factory to factory.

After hearing the views of purchasers other than the C.E.A. and Electricity Boards the Commission says that many of them have expressed their satisfaction with the quality of British machines to which common prices apply and some have spoken very highly of them. There is little criticism of the level of common prices and the evidence suggests that "at least up to 1952" the prices of United Kingdom manufacturers in export markets generally compared favourably with them. On the other hand, the common price system has been adversely criticised by the Crown Agents for Overseas Governments and Administrations and by "a nationalised industry which buys motors and transformers for use in the United Kingdom." The Ministry of Supply has also passed on a few official representations made by overseas countries. The recent Snowy Mountains transformer contract is referred to and the circumstances are explained.

The C.E.A. and Electricity Boards have criticised the manufacturers' price arrangements on various grounds. It believes that price agreements are inimical to competition and tend to higher prices; members of the Groups hold the opposite view. The C.E.A. holds that the existence of an important manufacturer who is not a member has tended to restrain price increases.

In their reply the Groups point to the need for guarding against the return of conditions which prevailed before they were established and contend that with the existence of strong monopolistic chief home customers there is a danger of the recurrence of such conditions. They stress the need for stability in an industry with such costly capital equipment and in which the ratio of overheads to direct labour costs is exceptionally and necessarily high. The Groups recognise that the regulation of competition may endanger the public interest but claim that they have always been most anxious not to abuse the power which co-operation has given them.

They say that price arrangements have helped to foster expansion, have not excluded new entrants to the industry, have contributed to technical efficiency, have not resulted in unreasonable prices and have helped in securing export trade. It is contended that uniform contract conditions are necessary and that there are good reasons for their discounts and rebates system. After dealing with other points the Groups say that the setting up of the C.E.A. has made their members' position as sellers weaker than it ever was before.

The British members of the I.E.A. (not the Association itself) have presented a case for the quoting of common minimum prices for export contracts. Pointing to the great increase in electrical export trade they contend that the risk of losing business because of common prices is slight. They are anxious to get the co-operation of foreign manufacturers in maintaining a reasonable level of world prices.

The B.E.A.M.A. submits that its activities are "not of much interest to a Monopolies Commission" since "in B.E.A.M.A.'s story there is no chapter on restrictive practices." Attention is drawn to the Association's activities in the fields of research and development, standardisation, studies in economics, education and training, and export. It defends its contract conditions; its interest in these is in no way related to price arrangements.

Commission's Conclusions

In conclusion the Commission sums up the evidence at great length. It says it has found that the common price system of the Groups and the I.E.A. operates, and may be expected to operate, against the public interest in relation to the supply and exports of machinery in each of the Classes (*a*), (*b*) and (*c*). It has also found that the other Group and I.E.A. arrangements it has dealt with in this chapter, except compensation and the arrangements between the condenser makers and suppliers of components, operate against the public interest inasmuch as they support the common price system, and that in the following cases they would operate against the public interest in the absence of a common price system:—

(i) The compensation arrangements in relation to the supply and exports of most machinery in Class (*a*) and certain machinery in Class (*b*) (paragraph 799);

(ii) The notification arrangements in relation to the supply of machinery in the three Classes, and also in relation to exports of such machinery insofar as overseas manufacturers participate in them;

(iii) All the differential price arrangements in relation to the supply of machinery in the three Classes insofar as they are obligatory or involve the listing of individual buyers entitled to allowances, and the arrangements in relation to the supply of certain machinery in Classes (*b*) and (*c*) for discounts and rebates based on the aggregation

of purchases, or on buying a given proportion of requirements, from a number of manufacturers;

(iv) The protection arrangements in relation to exports of certain machinery in Class (*a*);

(v) The arrangements for common conditions of sale and contract in relation to the supply and exports of machinery in the three Classes insofar as they are obligatory; and

(vi) A number of minor practices in relation to the supply and exports of machinery in the three Classes.

It recommends that all the Group and I.E.A. agreements in which are embodied the common price arrangements or any of the arrangements which it has found operate or may be expected to operate against the public interest should be terminated, and that the United Kingdom manufacturers should not in future enter into any agreements or arrangements with one another, or set up any other organisation, for these purposes.

With regard to the arrangements between the condenser makers and suppliers of components in relation to the supply and exports of certain machinery in Class (*a*), it has endorsed the conclusion in an earlier report of the Commission that these should be brought to an end.

The Commission sees advantage, as regards both supply and exports of all classes of machinery, in co-operation between the manufacturers in technical matters. It also sees advantage in the pooling of market information in respect of exports; for this reason it finds that the notification arrangements for exports would not operate against the public interest in the absence of a common price system, provided that overseas manufacturers did not participate. It also sees no objection to recommended model conditions of sale and contract under any of the heads of its reference.

It has not found anything adverse to the public interest arising from the special positions of the C.E.A. and of the subsidiaries of A.E.I. in relation to the supply of machinery in Class (*a*).

In a dissenting note Mr. C. E. Wrangham, one of the members of the Commission, says he is not prepared to say that, in relation to exports, the common price system operates against the public interest. He gives reasons for this.

Heavy Plant Manufacturers' Comments

The Heavy Electrical Plant Manufacturers have issued a statement in which they characterise the Report as "the most doctrinaire and at the same time the most unrealistic document that has yet emerged from the Commission." They say that it bears lamentably little relation to the facts of the industry as manufacturers have learnt them by first-hand experience.

The Commission says that the practices of the industry tend to inflexibility and a defensive and cautious attitude. This, it is contended, can hardly be true of an industry that has within the last year become the country's largest exporter with a total of over £272 million in 1956 compared with £160,000,000 in 1950, and whose products are admitted to be second to none and are sold against foreign competition in 72 countries throughout the world. Even the Commission does not allege that in achieving this record undue profits have been made.

"It is astonishing how little criticism from purchasers the Commission could find of the system of common prices on which the success of the industry is based. The industry is so firmly convinced that its practices are in the national interest that it welcomes the opportunity now given to it of proving this conclusively before the Restrictive Practices Court where facts will be given their due weight. The industry has made an immense contribution to national economy and the contribution it can make in the future will depend very largely on the extent to which it is allowed to manage its own affairs."

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Home-made Electrical Apparatus

THERE is a growing tendency, in this "do-it-yourself" age, for publishers of certain popular magazines to print instructions on aspects of engineering and construction that in the past have been regarded as the function of the adequately supervised craftsman. Many of these publications serve a useful purpose because it is recognised that the day-to-day tasks around the home, such as painting the kitchen door, fixing a latch on the garden gate and minor carpentry, are well within the capabilities of the householder with a practical bent. However, the publishers concerned can only be described as misguided when they encourage amateurs to embark upon such intricate work as electric wiring and the home manufacture of electrical apparatus.

One such magazine advised a reader (who wished to know how to manufacture a small hot-plate to hold a coffee pot and milk jug) to construct a small heating element—to be placed in a plastic "dish"—from nickel chrome resistance wire wrapped around a strip of mica or asbestos board. Another article in the same issue of the magazine described how a lawn mower may be electrified from a circuit consisting of a ¼ h.p. motor, a length of three-core t.r.s. cable, three 3-pin 5 A plugs, a metal-cased 3-pin switched socket box and a 5 A socket, all connected to a lighting circuit in the house. Care was taken, of course, to mention the necessity of an earth wire, if not already present, being brought from the steel conduit on a power circuit.

The responsible authorities are, I know, cognisant of the danger of serious or fatal accidents arising from amateur extensions to existing wiring installations and the connection to mains supply of home-made electrical apparatus. Unhappily, I feel that the public is not fully conscious of the risk involved and that electrical engineers as a body do not sufficiently discourage the public from indulging in the practices mentioned. What action is contemplated by the appropriate authoritative bodies with a view to actively discouraging the continued publication of the articles to which I have referred?

London, S.E.5. G. H. COOK.

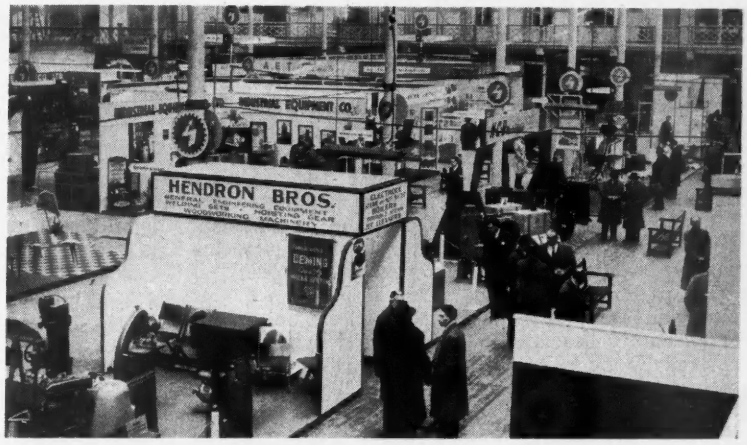
R.S.A. Bursaries Competition

THE Royal Society of Arts has announced the results of its industrial art bursaries competition for 1956. The winner in the domestic electrical appliances section (bursary £150) was Mr. D. L. Morgan (Kingston School of Art), and in the electric light fittings section (bursary £150) Mr. B. Sams (Birmingham College of Arts and Crafts).

ELECTRICITY

AND

PRODUCTIVITY



Dublin Conference and Exhibition

THE Royal Dublin Society's Main Hall at Ballsbridge, Dublin, was the scene last week of the first Electricity and Productivity Conference and Exhibition held in Ireland, which opened on 18th February and ran for five days. The Exhibition, sponsored and organised by the Electricity Supply Board of Ireland, consisted of over 50 stands bearing goods from Irish manufacturers, and those of Britain, France, Western Germany, Holland, Belgium, the United States and Sweden. Admission was by invitation only to over 14,000 principal people in Irish industry, including engineers, architects, industrialists and technicians. A wide range of goods was exhibited—covering lighting, communication, heating and cooling systems, radio, factory machinery, electric tools and motors and medical equipment.

Advances in lighting equipment were shown by seven concerns, including the A.E.I. Lamp & Lighting Co., Ltd., of London. Their most interesting exhibit appeared to be an industrial flameproof fitting, for hazardous locations where Groups 2 and 3 gases are present in the atmosphere. Also of interest was a blended light system, consisting of a high bay concentrating aluminium overlamp reflector, fitted with a 1,500 W GLS lamp, together with a 1 kW mercury lamp, housed in a horizontal mercury reflector.

A complete range of tungsten, mercury and fluorescent fittings for industrial use were shown by the Benjamin Electric, Ltd., London. The majority of these were finished in " Crysteel " vitreous enamel, especially useful in factories with humid and corrosive atmospheres. With effective sealing off, it is claimed that internal wiring, gear and contacts cannot be penetrated by dust between the heavy brass lampholder and the lamp.

Falk, Stadelmann & Co., Ltd., also showed a wide range of equipment for lighting, including the " Winston " vapourproof, dustproof and corrosive-resistant fitting designed for heavy industry, such as docks and harbours, chemical works, gas works, railways, plating shops, etc.

The General Electric Co., Ltd., Dublin, exhibited lighting fittings employing " Osram " fluorescent tubes.

Electric tools attracted a great deal of interest. For example, the shockproof tools, from Robert Bosch G.m.b.H., Stuttgart, Germany, with built-in suppressors and the Black & Decker industrial electric tools, including saws, grinding machines, portable hammers, screwdrivers and drills. The exhibit of Bridges Industrial Electric Tools included electric shears for cutting sheet metal, and Wolf Electric Tools, Ltd., London, introduced a wide range of electric drills.

The title picture shows a general view of the exhibition in the main hall of the Royal Dublin Society

Heating Developments

Especially interesting during the cold weather experienced during the Exhibition was the range of heating apparatus. From A.E.T. Ireland, there were industrial thermal storage water heaters of three types—free outlet, pressure and cistern; also night storage heaters and overhead radiant heaters designed to provide warmth in large places such as machine shops, warehouses or community centres too large to heat efficiently by air conditioning or other methods. A.C.E.C. (Ireland), Ltd., displayed the " Phytorel " special lighting fitting to stimulate the growth of vegetable crops.

The Aberdare Electric Co., Ltd., introduced " Thermodare " floor heating with automatic control, night storage heating units, and an infra-red system for quick heating, for conditions where the rate of air change required is high—as in some factories—or where currents of air cannot be avoided. This, it is claimed, is useful for outside heating such as cinema queues, shop windows, gymnasiums, waiting rooms, garages, etc.

Industrial induction heating and dielectric apparatus from Redifon, Ltd., was displayed, and also electronic heaters from the English Electric Co., Ltd.

Products on view from the Yale & Towne Manufacturing Co. included fork trucks with capacities from 1,000 to 100,000 lb, tractors and other special equipment designed for specific industries. Bastian & Allen, Ltd., Harrow, Middlesex, introduced their latest designs of electrode boilers with a range from 30 to 1,000 kW. Electric welding machines, steam turbines, refrigerating plants and drying plants from Sweden were displayed by Asea Electric (Ireland), Ltd., and many new ideas in tubular conveyor systems, tipping carrier and other equipment for factory interior transport of goods were shown by Fisher & Ludlow, Ltd., Birmingham.

Scientific and medical equipment took a large place in this exhibition. On the stand of the Irish Light Engineer-

ing Co., Ltd., representing Hilger & Watts, Ltd., were the latest "Spekker" absorptiometer and fluoriometer, a glassware strain viewer for examination and determination of strain in glassware, and other laboratory instruments and microscopes from W. Watson & Son, Ltd. A Marconi portable X-ray set for industrial operation was also exhibited.

The exhibit of Telecommunications, Ltd., included radio control to cut down time loss in industry, the "Reporter" mobile radio-telephone, and an automatic depth sounder designed to cater for the needs of yachts, pleasure boats, small fishing vessels and river barges.

Philips Electrical (Ireland), Ltd., displayed a tubular ultra-violet lamp for germicidal purposes and an ozoniser to effectively irradiate offices. Plant propagation was covered by the "HK 11" fitting, which has a 400 W mercury vapour lamp, and fluorescent lighting suitable for young plants. In the infra-red lamp section there were units for chick rearing and pig breeding and a small bank of drying lamps. A second Philips stand was devoted to scientific apparatus and public address, telecommunication and industrial equipment.

Petrol rationing lent special interest to the Murphy Electric Co.'s display of N.C.B. electric vehicles. Pye (Ireland), Ltd., showed the "Talk-Box," an advanced form of intercommunication which uses the ordinary electric wiring in a house, office or shop as a carrier. Also seen on this stand was a TV camera and equipment for use in industry or for teaching—as in hospitals or medical schools.

Opening of Conference

During the Conference overflow audiences necessitated the use of a second lecture hall with the speakers' voices relayed on an extended amplification system and a duplicator projector to show slides.

The attendance on the first day was over 1,200 and it included production personnel from many of the largest factories in Ireland.

Mr. R. F. Browne, chairman, Irish Electricity Supply Board, opening the Conference, said that the rate of scientific progress in the application of electricity to industry had been so rapid in recent years that it had been difficult, for one reason or another, for industrialists to keep pace with what had happened. His Board had decided that a special effort should be made towards creating in the minds of those concerned in the welfare of Irish industry a greater awareness of the importance of keeping abreast with the march of progress.

A paper on "Prosperity, Productivity and Electricity," by Mr. L. Landon Goodman, British Electrical Development Association, was dealt with in our last issue.

Mr. Allan C. Cooper, M.S.M.A., general manager of I.T.D., Ltd., London, speaking on some principals of materials handling, said that a tremendous amount of wastage could take place in the simple problem of moving things around the warehouse, store or factory floor. Most of the waste occurred in the unprofitable use of manpower. Having mentioned the uses of overhead and mobile cranes, conveyor systems, moving floors, etc., he said that one of the machines which came closest to the self-loading ideal was the fork-lift truck.

The art of good materials handling, Mr. Cooper emphasised, was the elimination of unnecessary motions wherever that could be justified, but not to use mechanisation as an end itself. Unit loads should be employed wherever possible and handling processes should co-ordinate with production processes to deliver at the right place in the right quantity at the right time.

Speaking on industrial lighting, Mr. F. X. Algar said that the frame of mind of the worker, undoubtedly, had a considerable influence on the quantity and quality of the work he turned out. The harmony and efficiency of a factory might depend on its lighting as much as on any other single physical factor. Accidents, he said, were the cause of serious industrial losses, and bad lighting was known to increase human carelessness, fatigue, and many other factors which were responsible for them. Therefore lighting should be properly planned. "Bad lighting will force the operative to move in closer than is safe to see the moving parts of machinery. It blinds him with glare, and creates deep shadows which may conceal danger. It is a strange fact that a very high proportion of factory accidents are traceable to people simply falling and, in most cases, falling into or over things which they failed to see in time to avoid them. Properly planned lighting will reduce the accident potential." It was, however, as a "tool" that lighting played its major role in the production effort. Lighting was as much a production tool as the most complicated machine into which materials were fed; and from which a product emerged.

Speaking on "Mechanical Handling Equipment and its Application" Mr. F. T. Dean said that the range of equipment on the market now was so great that it was impossible to cover it all in one paper. He went on to describe the operation of mono-rail conveyors, electric pulley blocks, overhead cranes, pallet cranes, etc., with practical illustrations of their application in various industries.

Waveform Analysis

A DISCUSSION on the analysis of waveforms was opened on 26th February before the Measurement and Control Section of the Institution of Electrical Engineers by Mr. A. Cooper, who stressed the need for more rapid methods in view of the widening scope of the subject. Waveforms could be classed either as repetitive or transient with frequent combinations of the two. Analysis called for measurement of the component frequencies and amplitudes and possibly phases. The equipment consisted of a transducer, analyser and recorder, the analyser receiving the speaker's main attention. Components could be separated by an arc electrical filter of either the heterodyne or tuned types, but the first was restricted to waveforms of stable frequency.

The importance of speed in measurements was also emphasised by Mr. D. A. Drew, who pointed out that aero engines might cost £100/hr to run on a test bed or £500 in flight, while vibration tests often had to be fitted in between other tests. He then outlined techniques employed to get quick approximations.

Post-Graduate Courses in Science

THE following courses at Liverpool University are designed to provide information regarding recent developments in fundamental science which have important practical applications in industry; they are open to graduates and others of comparable qualifications in the appropriate field of study:—Basic principles of nuclear engineering (7th-13th April); tensor analysis applied to electrical engineering (7th-12th April); numerical methods for engineers and physicists (8th-12th April).

Forms should be returned to the Director of Extra-Mural Studies, The University, 9, Abercromby Square, Liverpool, 7, not later than 4th March, and should be accompanied by a registration fee of £1.

Engineers and Clean Air

DISCUSSIONS AT THE INSTITUTION OF MECHANICAL ENGINEERS' CONFERENCE

THE part to be played by engineers in implementing the Clean Air Act (1956) was the subject of a conference from 19th to 21st February sponsored by the Institution of Mechanical Engineers, whose president, Mr. T. A. Crowe, opened the proceedings with appreciatory messages from the Ministers of Power and of Housing and Local Government. In an introductory lecture Sir Ewart Smith (Imperial Chemical Industries) summarised the provisions of the Act and outlined the problems which were dealt with more specifically in some twenty papers.

The domestic fire, he pointed out, was the main producer of smoke (which it emitted at a low level), followed by general industry, which came first in regard to grit and dust. To convert many thousands of industrial plants and many millions of small domestic units to smokeless combustion would take all of the fifteen years envisaged in the Beaver report. On the other hand, all larger new industrial installations were required under the Act to have anti-pollution equipment, railways would be changed over to diesel or electric traction within that period and electricity would provide most of the energy for the expected increase in industrial production. Pollutants from the iron and steel and the cement industries would be reduced by a wider use of electric furnaces when enough power from atomic energy became available. No effective means of removing SO_2 from effluent gas was yet in sight; the best palliative was high discharge from the minimum number of chimneys.

In addition to the £250 million per annum estimated as the direct cost of pollution by the Beaver Committee, the least figure attributable to incomplete combustion would be £25 million per annum, while indirect damage from oxides of sulphur and residual pollutants would account for a further £100 to £150 million. Remedial measures were calculated to cost £625 million, giving an annual figure of about £40 million per annum, if spread evenly over 15 years.

Boiler Design

Smokeless combustion in boilers rated at over 40 k lb/hr was covered by Mr. W. F. Simonson (Water-tube Boilermakers Association) who referred particularly to the effect of chlorine and sulphur in forming deposits on high-temperature surfaces and of sulphur in causing corrosion of low-temperature surfaces. The resistance of fouled tubes upset the delicate balance of the fuel-air ratio and, since combustion efficiency was highest when smoke was on the point of being produced, this made automatic combustion control a virtual necessity for large boilers.

Developments in boiler design leading to smoke reduction included: larger combustion chambers with air admission within them to avoid impingement of flame on cooler tube surfaces and to accelerate the combustion of hydrocarbons volatilised through turbulent mixing; pre-heated air in enclosed forced-draught stokers; incorporation of front, rear and side wall cooling tubes, the radiant heat from which also obviated the need, except when firing low-volatile semi-anthracite coals, for the front ignition arch formerly used to sustain ignition temperatures.

The spreader stoker, burning coal in partial suspension, had proved able to cope efficiently with a wide range of fuels, even when frequently changing in quality, with steam outputs up to 280 k lb/hr. Coals having a chlorine content of 0·55 per cent had to be blended with other coals to reduce the mean percentage to 0·25 to 0·3 to avoid severe bonded deposits. More elaborate external mechanical grit-catchers were required than with travelling-grate stokers and, for thermal efficiency, the coarser grit particles of high carbon content had to be intercepted within the boiler and economiser passes for refiring at the rear of the grate.

Constructional considerations limited the dimensions of mechanical stokers to boilers of 280 k lb of steam per hour, so for large boilers pulverised fuel firing or the cyclone furnace or oil firing was necessary. Modern pulverised fuel furnaces had a liberal design of combustion chamber with heat release rates of about 20,000 B.Th.U./cu ft/hr compared with 40,000 of twenty years ago, but furnace gas exit temperatures in relation to superheat and ash-fusion temperatures were now the designer's criterion.

Types of Furnace in Use

The dry-bottom furnace was most popular in Great Britain largely owing to its adaptability with coals of varying ash fusibility. It had caused little trouble from fouling, except with high-chlorine coal, or from low-temperature corrosion and deposits, but 80 to 90 per cent of the total ash from the furnace was carried forward in the gas stream, which entailed the provision of electrostatic precipitators.

The wet-bottom furnace, as widely adopted on the Continent of Europe, retained most of the ash which was deposited as molten slag, but most British coals had ash-fusion temperatures of 2,500 deg F or more, which was too high to prevent slagging difficulties at low loads and with two-shift operation. This type of furnace had been installed at one C.E.A. station, where it was demonstrated that ash-fluid temperatures of 2,370 deg F but not 2,730 deg F could be dealt with.

Of all recent developments the cyclone furnace (several units of which were under construction in this country) showed most promise in respect of smokeless and efficient combustion. From 85 to 90 per cent of the total ash was retained in a slag tank with a corresponding simplification of equipment for external grit catching and for refiring the dust so collected. Satisfactory operation had been reported from abroad with 10 per cent excess air and very small loss from unburnt carbon; oxidation of sulphur dioxide to trioxide was said to be negligible, eliminating air-heater corrosion.

For oil firing fine atomisation over a wide range of loads was a first essential. Delivery to burners at the correct viscosity called for preheating of heavy oils to 250 or 300 deg F. For high individual burner outputs an oil pressure of 500 to 600 lb/sq in was commonly adopted. Operational control to effect the best efficiency with smokelessness and to avoid sulphur dioxide conversion to trioxide was more sensitive than with coal. Acid dew point and carbon dioxide content of flue gases were related and indicated an optimum CO_2 value of 13½ per cent at the economiser outlet to give highest combustion efficiency

without causing smoke and to alleviate air heater corrosion.

Mechanical grit and dust collectors were described by Messrs. J. E. Johnson and G. C. Goodwin (Davidson & Co.) under three main types, viz. cyclone, shunt and multi-unit. The efficiency of the first, good in small units, fell as the size increased and the pressure drop was usually limited economically to 2 to 4 in w.g. In the shunt type (the most extensively used), a portion of the gas was skimmed off at the periphery of the primary separator and led to a small secondary cyclone for final separation. There were three main designs varying with their duties. They occupied less space than cyclones; their pressure drop was smaller and they had a better efficiency at low loads, though the maximum was likely to be lower.

A variation in dust concentration or burden would not appreciably alter the efficiency. A total emission as low as 0·1 grain/cu foot was not infrequently required in large modern installations, compared with 0·4 with not more than 0·15 exceeding 20 microns in diameter, as recommended by the former Electricity Commissioners.

Removal of Sulphur Dioxide

Flue-gas washing for the removal of sulphur dioxide was the subject of a paper by Mr. R. Ll. Rees (Central Electricity Authority) who said that Great Britain appeared to be the only country in which this had ever been undertaken. The effluent process adopted at Battersea power station and subsequently at Bankside, which was the only kind still in use, also carried away to sea the calcium sulphate. At Bankside 95 per cent of the SO_2 was removed from gases derived from oil containing 3·8 per cent of sulphur and at Battersea a somewhat lower proportion from coal containing 1 per cent of sulphur. The effluent was oxidised by aeration in the presence of manganese, but the permissible residue of de-oxygenating material could be tolerated only in already polluted large rivers, such as the Thames, and then from no more than these two power stations. The heavy cost of installing, operating and maintaining the process would be equivalent to adding 8s to 10s per ton to the cost of fuel.

In the Howden-I.C.I. cyclic lime process the solution coming from the scrubbers, which was supersaturated with calcium sulphate, was mixed with a suspension of lime or chalk. It had been used at Tir John power station (Swansea) and then at Fulham, but had been abandoned. It removed over 95 per cent of the SO_2 but was expensive and also very difficult to maintain. Typically it would entail the removal of considerably more than 1,000 tons/week of valueless wet calcium sulphate. The all-in cost at a modern power station would equal 17s per ton of coal.

An experimental ammonia recovery plant, the Fulham-Simon Carves system, had recently been installed at North Wilford power station. Its function would be to remove SO_2 while retaining the ammonia used for washing the gases. The liquor bled from the circulating system was heated under pressure with sulphuric acid to produce ammonium sulphate and sulphur. The ammonia liquor made available was unlikely to be enough to serve more than half-a-dozen stations. Other ammonia processes being investigated abroad indicated the possibility of profit if the flue gases contained more than 0·4 per cent of SO_2, whereas the British average was 0·1 per cent. The great defect of all washed flue gas was that being cool and laden with carbon dioxide and condensed water droplets, its density brought it to ground level very much nearer the point of emission than when unwashed and hot.

Electrostatic precipitators were considered by Dr. J. S. Forrest and Mr. H. J. Lowe (Central Electricity Research Laboratories), who stated that the capital expenditure by the C.E.A. on gas-cleaning plant at power stations for commissioning between 1955 and 1961 amounted to £1·9 million for precipitators and £0·5 million for mechanical collectors. The average cost was about 10 per cent of the boiler contracts on 2·5 per cent of that of the stations. Combination of the two methods was specified when extraction efficiencies of 98·5 per cent or above were required.

Important design features were: uniform gas distribution; avoidance of by-passing of the precipitating zone, whether in operation or during lighting-up periods; remote control, preferably automatic, of the electrical discharge under varying operating conditions; surge limitation by inserting a resistance dropping about 25 per cent of the supply voltage at normal load and capable of withstanding surges equal to the full supply; less frequent rapping of electrodes; suppression of interference with radio.

Other matters under investigation included deterioration of performance of precipitators in combined plants after the cleaning of mechanical precollectors and also when certain coals were burned. The latter effect, the authors' tests had shown, was unrelated to resistivity of the dust if the operating voltage was maintained.

The chief cause of smoke emission and hence serious waste of fuel was attributed by Dr. Angus Macfarlane (National Industrial Fuel Efficiency Service) to faulty operation by untrained stokers. In his paper on the education and training of boiler operators, he gave their number throughout the country as 75,000. Only a small percentage had so far undertaken the courses organised by the technical colleges (Manchester being prominent early), the National Coal Board (1952), the Central Electricity Authority (1949) and N.I.F.E.S. (1952), of which particulars were given by the author. The N.C.B. scheme, based on seven months of correspondence tuition, was largely responsible for the introduction of a Boiler Operators' Certificate by the City and Guilds of London Institute. The C.E.A. series was residential and by correspondence and had been attended by 3,300 students. The national average of successful candidates in all schemes was about 80 per cent. It was emphasised that the vocation of boiler operators was a skilled one. Proposals had been put forward that a certificate of proficiency should be compulsory in all but the smallest installations as it is in some other countries. An essential factor was to secure the interest of managements (to their own advantage from fuel saving) in providing incentives and opportunities to the men who completed recognised courses of instruction.

DISCUSSION

Opening the discussion, Mr. C. J. Stairmand said that deposition in a combined cyclone plant was only about 7 per cent of that in the normal precipitator. Cyclic rapping resulted in a 36 per cent reduction in the emission of dust, which meant that for the same capital cost and basic efficiency of plant, one had only 5 per cent of the deposition.

Mr. G. M. Peterson pointed to the need for an instrument for continuously measuring the performance of a precipitator. He questioned whether gas washing was desirable and whether the existing techniques of using high chimneys and relatively high exit gas temperatures were not adequate to obtain dispersion of sulphur gases.

Dr. R. Lessing doubted whether high chimneys did away with the real damage from acidic compounds in flue gases. There might be an improvement near the point of emission, but somewhere the acid would meet

other materials, and the fact that it was acid, although diluted, would never disappear.

Mr. C. E. H. Eckersley had found that nearly 50 per cent of dust collectors in small plants were not working, and of the remainder only a few were working at maximum efficiency.

Mr. J. W. Parkington stated that an electrostatic precipitator not preceded by a mechanical extractor and designed for a high collecting efficiency would occupy considerably more ground space than a combined unit of the same efficiency level. Double tiered arrangements would result in increased first costs and possibly objections on artistic and architectural grounds. If the fuel were difficult to precipitate or if the overall effective migration velocity were reduced, a pre-collector would limit the increase in dust escaping to atmosphere to three-quarters to one-half of the amount without a pre-collector.

Mr. W. F. Carey asked why so much inertia collector equipment was expected to remove particles greater than 20 microns. In fact, it allowed particles much greater than 100 microns to escape. It was most important to prevent the clean gases from having contact with the concentrated dust leaving at the bottom of the separator.

Mr. S. Laurie-Walker observed that from the experiments by Dr. Forrest and Mr. Lowe it appeared that if resistivity alone was altered, the effect on precipitator efficiency was negligible. Why then, were some dusts known as "difficult"? Could carrier gas and not the electrical properties of the dust itself be responsible?

Extremely violent electrode oscillation could be induced in a precipitator by varying the ratio of the constituent gases—ammonia and sulphur dioxide—and stability could be regained by reverting to a stable composition. Possibly that indicated a relationship between precipitator stability and operation and gas composition.

Mr. J. D. Knox commended the continuous slagging furnace in which all dust collected in the precipitators was continuously re-fired, which meant that all the ash from the coal was removed from the unit in granular form by way of the slag tank.

Mr. H. G. Trevor Busby said that operation over two years at Croydon "B" power station answered critics of electrofilter performance that guaranteed performance could not be maintained over a long period.

Mr. Peter Pilkington said that insufficient emphasis had been placed on the merit of the cyclone furnace in not creating a problem of catching dust at all. A good cyclone furnace could catch about 90 per cent of the ash in the furnace, leaving only 10 per cent to be dealt with externally.

Mr. K. W. Francombe questioned the suggestion by Dr. Forrest and Mr. Lowe that surge resistors should drop the voltage supplied to the discharge electrodes by 25 per cent, because it increased the power consumption of the plant by 33 per cent. Normally a 10 per cent drop was sufficient to stabilise the operation of a precipitator.

Dr. Walter A. Woeber remarked that the subject of air pollution cou'd not be divorced from discussion of the meteorological aspects.

Training of Operatives

Mr. R. S. Bellamy held that the best results were obtained when local managements of industries were concerned with training problems. In the electricity supply industry, operatives had been trained by residential courses, correspondence tuition and practical training on site, and local staff engineers had been involved from the start.

Mr. G. Nonhebel drew attention to the many untrained boiler operators in small plants. Coal was a non-uniform product and a meter was essential to show whether too much or too little air was being used. The CO_2 meter had established itself for small plants but unfortunately even if installed it was probably out of commission in half the boiler houses of this country. What was wanted was a robust and cheap instrument. Another difficulty was the maintenance of instruments by different manufacturers on the same panel. Here there was a case for service companies with staffs competent to deal with all the common makes who would put in service spares and get instruments running when they broke down.

Standards and Efficient Combustion

Mr. G. Weston (British Standards Institution) outlined the work of his Institution in preparing standards on the recommendation of the Beaver Committee for ensuring efficient combustion. The co-operative efforts being made by the several interests represented on the B.S.I. committee were making a valuable contribution to clean air.

Mr. Arnold Marsh thought the first requirement was to create awareness of the need for trained operators and to make it attractive for the operator to take a course and sit for an examination. The National Smoke Abatement Society, or rather its parent bodies, had pioneered the training of boilermen nearly half a century ago. Engineers could do much to promote discussion and then action in their own areas and industries, particularly through trade associations, chambers of commerce and trade unions.

Mr. A. Coe said that the National Coal Board trained men in terms of their own plant. This was preferable to attempting to cover all types of plant in the same course. The great problem was to get new knowledge continuously applied. One serious question was who was to bear the expense of training the necessary smoke inspectors.

Mr. Colin Troup considered that industry had not seriously encouraged boiler operators to take training courses. The men needed both encouragement and an incentive—not only a financial reward but a chance to put their newly acquired knowledge into use through the provision of the necessary instruments. Government loans for fuel saving devices might be coupled with the requirement that certificated men should be employed.

Mr. Alan Wilson suggested that boiler men should be employed on the staff as charge hands with the benefits of security, the hard work being done by labourers.

Mr. W. Stainsby said that provided a single fuel was used a CO_2 meter would give a good indication of combustion efficiency. The oxygen meter had advantages with mixed fuel firing. It would be interesting to know how one arrived at combustion efficiency, however, when neither could be used.

Dr. G. E. Foxwell, in summarising the Conference, expressed his belief that the emission of dark smoke within the meaning of the Clean Air Act was capable of an economic solution through good maintenance, skilled handling of plant and trained stokers. Grit and dust constituted a more difficult and costly problem. The cost of implementing the Act, though burdensome, was not intolerable in the light of material costs and savings. Nor must the vast to'l that air pollution took in health, lost working time and lost production be overlooked.

The chairman (Sir Hugh Beaver) said that he had come to the conclusion that the figure of £250 million given by the Air Pollution Committee as a conservative estimate was a considerable understatement, perhaps by 200 per cent. He pointed out that while strikes had caused a loss of about 2½ million working days last year and 4 million the year before, 45 million working days were lost in 1954 from bronchial causes.

INDUSTRIAL NEWS

Power Engineers' Dispute

As the outcome of meetings of representatives of the Central Electricity Authority and Electricity Boards and of the Electrical Power Engineers' Association, under the auspices of the Ministry of Labour last week, it was agreed that the Minister should set up a board of arbitration to examine the dispute over power engineers' salaries. Both parties to the dispute agreed to accept the board's findings and the E.P.E.A. undertook to withdraw the "work-to-rule" instruction to its members.

Electricity Supply Wages Claim

On 21st February discussion of the claim for a "substantial" increase in wages made on 17th January by five trade unions for members in the electricity supply industry was adjourned until 13th March. It was agreed that any increase subsequently granted would be dated back to 1st March.

New Irish Aberdare Factory

The Aberdare Electric Co., Ltd., Finglas, Dublin, plans to build a new factory for the manufacture of aluminium foil and ancillary products, aluminium sheet, overhead cable and plastic transparent film, in agreement with Reynolds International, Inc., a subsidiary of Reynolds Metals Co., of Richmond, U.S.A. A letter to Aberdare Electric shareholders states that Reynolds are undertaking to make available, for ten years, their technical knowledge, services, and manufacturing methods, to the new undertaking. Certain of their patents will also be made available. The company also plans to manufacture high tensile steel wire for use as the core of aluminium overhead electric cable. To finance these developments, the company is issuing 1,000,000 5s ordinary shares (see "Financial Section," page 408). Of this issue, Reynolds will subscribe for 120,000 shares. The balance of 880,000 shares will be available for public subscription, priority being given to existing shareholders, who will receive a proportion not exceeding one new share for every four held. They may, however, apply for shares in excess of those amounts. The name of the company is to be changed to Unidare, Ltd.

New Osram Trading Structure

Details of revised trading arrangements applicable from to-day (Friday) on Osram lamps (Groups 1 and 9) are announced by the General Electric Co., Ltd. The revised arrangements include changed discounts for most classes of buyers, and the introduction of quantity terms for users based on the list values of orders. A minimum quantity requirement has also been introduced, per item, on orders for general purpose lamps. Lower discounts will operate for smaller quantities. The category: "Osram General Purpose Lamps" covers 200/260 V group 1 lamps, with b.c. or e.s. caps, in the range 15-200 W in the following finishes:—Clear, pearl, silverlight, pink pearl.

South African Uranium

The Durban correspondent of *The Times* says it has been announced that last year South Africa was the leading producer of uranium oxide and in future years will be surpassed only by North America. Official estimates of the price received range from 70s and 85s per lb of oxide and in 1956 the value of South African exports of uranium and other radioactive minerals was nearly £40 million sterling. Known reserves of uranium ore exceed 1,100 million tons with a uranium oxide content of 370,000 tons, compared with 237,000 tons in Canada and 150,000 tons in the United States.

Industrial Fires and Explosions

In 1955 a Committee on Industrial Fires and Explosions was appointed by the Fire Research Board (Department of Scientific and Industrial Research and Fire Offices' Committee Joint Research Organisation) and the Committee has now issued a summary of its proceedings during 1955-56. At its first meeting the Committee suggested that reviews should be prepared on various subjects to help in deciding where research effort is needed. So far reviews have been prepared and considered on the following subjects: Certain aspects of gas and vapour explosions, detectors for flammable gases, ignition by friction sparks, and ignition by electrostatic discharges. The first of these reviews has been published (J. Inst. Fuel, July, 1956), and it is hoped that others will be published in due course. The Committee considered that among the subjects on which fundamental information was particularly scarce, and which were therefore worthy of priority, were the relief venting of explosions, the operation of flame arresters, and the development of detonation in long pipe lines.

The Factory Department of the Ministry of Labour and National Service has drawn attention to the increasing need in industry for detectors of flammable gases, and the Committee has recommended that an attempt should be made first to assess the performance and reliability of available instruments, rather than to develop new types. Another problem of the Factory Department is the definition and testing of various unstable substances which give trouble from time to time in industry, but which are not on the list of scheduled explosives. Arrangements have been made by which tests can be carried out on such substances when the need arises.

The Committee has noted an apparent decrease in the use of non-sparking tools in industry, particularly in the petroleum industry of America. It is not possible at the moment to say whether such a move is wise with some of the more sensitive gases and further information is being collected on this subject. It has been noted on the basis of statistical evidence that friction sparks are a much more frequent source of ignition of flammable dusts, than of vapours and gases, and this hazard requires investigation.

Standard Telephones Display

Next to the main entrance to its London headquarters at 63, Aldwych, W.C.2, Standard Telephones & Cables, Ltd., has established a display window

The new display window of Standard Telephones & Cables, Ltd.

and reception room which was brought into service on 18th February. Enclosed by plate-glass measuring 24ft long by 11ft deep, the window contains a display showing cable and super-high-frequency radio links manufactured and installed by S.T.C., and currently forming the backbone of the television transmission network in the United Kingdom.

Home Lighting

Organised by the Merseyside Electric Lighting Services Committee, a composite body on which all the electrical organisations of the area are represented, a public lecture with practical demonstrations on home lighting was given in the Philharmonic Hall, Liverpool, by Mr. D. W. Durrant (General Electric Co., Ltd.). There was an audience of 1,600 people. Mr. Durrant showed by rapid transformation pictures, a dozen different lighting treatments of two furnished rooms to accord with the harmony of respective decoration schemes. He emphasised that good lighting could be wasted by bad direction. Modern lighting fittings corrected that shortcoming.

Scottish Electricity Superannuation Scheme

A new superannuation scheme evolved by the South of Scotland Electricity Board as a consequence of the separation of South Scotland from the Central Electricity Authority, has been approved. It will cover all employees who were members of the B.E.A. and Area Boards' scheme, and other schemes, and it will apply to those manual workers who have hitherto not been members of a superannuation scheme.

British Columbia Development

The Wenner-Gren British Columbia Development Co. has appointed the British Thomson-Houston Export Co., Ltd., as technical advisers in the British Columbia Development Project, particulars of which were announced in British Columbia recently. The area is situated about 500 miles from Vancouver, and is in the Rocky Mountains Rift, south of the Yukon Border. The B.T.H. will prepare the assessment of the hydro-power potential of the area on the basis of which individual projects will be undertaken both as regards design and execution. The development of industrial projects will depend on the power requirements for pulp and paper mills, mining and mineral development, and transportation. The company will also act as electrical advisers to the Wenner-Gren British Columbia Development Co. in respect of electrical requirements of their interests. The work to be done by the B.T.H. Co. in assessing the power potential of the area will be in collaboration with Canadian engineering interests, and will be done concurrently with a mineralogical survey by the Lundberg Exploration Co., and with a forestry survey which is being carried out by the Ranking Co. of Montreal in collaboration with the Hedlunds Travaru Co., of Sweden. These surveys are all to be completed within eighteen months to two years.

Most of the survey work will have to be done by aerial facilities as there are no roads. These surveys will establish the potential resources of the area which are suitable for development, and these initial surveys will be used as the basis for preparing the development programme which will be submitted to the British Columbia Government for their approval.

The new Leeds showrooms of Prestcold (Pressed Steel Co., Ltd.)

E.W.F. General Meeting and Dinner

The annual general meeting of the Electrical Wholesalers' Federation will be held on 21st March at the Dorchester Hotel, Park Lane, London, W.1. The dinner in the evening (at 6.30 for 7 p.m.) will also be held at the Dorchester Hotel, and Professor D. R. Seaborne Davies, M.A., LL.B., Professor of Common Law and Dean of the Faculty of Law in the University of Liverpool, will be the principal guest.

Journal of the Engineers' Guild

The *Journal* of the Engineers' Guild has been entirely remodelled and it is now issued quarterly instead of appearing once every two months. The contents have been increased and it has a larger page size. Its policy is to present material reflecting the human factor in professional engineering, problems of personnel management, status, conditions of work, etc.

New Prestcold Branch

On 13th February a new branch was opened by Prestcold (Pressed Steel Co., Ltd.), at 17, Eastgate, Leeds. The new premises, which include attractive showrooms, were opened by Mr. E. G. Rowledge, director and general manager, refrigeration division, and among those who attended the opening ceremony were Ald. T. J. Jessop, Lord Mayor of Leeds, and the Lady Mayoress. The display windows are shown in the accompanying picture.

Uranium from Canada

Mr. Howe, the Canadian Minister of Commerce, stated last week that the Canadian Government was willing to enter into agreements with friendly Governments for the supply to them of uranium for peaceful uses of atomic power. The Government's purchasing agents would be Eldorado Mining & Refining, Ltd., who would negotiate sales contracts.

Bribery and Corruption Charges

Further evidence was given at Liverpool Assizes last week in the case in which Fred Gilmour, managing director of Gilmours (Manchester), Ltd., was accused of giving bribes to three employees of the Metropolitan-Vickers Electrical Co., Ltd., Cyril Hubert Smith (works engineer), Arthur Smith (surveyor) and George Thomas King (purchasing agent), who were charged with receiving them. All four pleaded not guilty.

Mr. W. Rothwell said that he sold his painting business to Gilmour's firm in 1951 and became manager of the decoration department. He alleged that Gilmour told him once that he had given Arthur Smith a television set for Christmas, and that he had Cyril Smith "in his pocket." On other occasions Gilmour told him he had got £3,400 from Metropolitan-Vickers for painting a roof included in a previous estimate, and that a car he had given to Cyril Smith was "a drop in the ocean." Rothwell said that he supervised work done by Gilmour's firm at the homes of the two Smiths and King. He never sent accounts for that work. Replying to Mr. D. Brabin, Q.C., for Gilmour, he denied threatening Gilmour that he would "commercialise his knowledge" of Gilmour's business if he did not get an extended contract as manager. He

denied that he was "burning with jealousy" of Gilmour.

Detective Chief Inspector F. Williams said that on being served with summonses alleging bribery, Gilmour said: "I've been too generous, but they will never stick corruption on me."

Replying to Mr. Brabin, he agreed that Gilmour's firm did work for some of the biggest firms in industry. He knew that Metropolitan-Vickers considered Gilmour's work to be of the highest standard. Gilmour was a man of tremendous industry and had no previous convictions. He denied asking a Mrs. Barton, a clerk at Gilmours, to get information from the books. He said that police called at her home to take a statement from her husband and she produced a sheet of paper with figures on it.

Mr. Justice Streatfeild: So Barton was wrong when he told us that his wife went through the books because the police asked her to?—Yes.

Replying to Mr. F. Atkinson, Q.C., for Cyril Smith, the inspector agreed that Smith's past was entirely creditable. He earned about £2,000 a year and was considered a conscientious and reliable works engineer. He had been told that decorations done at Smith's home were on a friendly basis and Gilmour had charged only cost price. If that was so there would be nothing in it. Smith had told him that he wanted a car, the inspector said, and Gilmour was able to get it much quicker. Smith found it awkward to pay at the time the car arrived and Gilmour lent him the money. The inspector identified a cheque for £778 repaid to Gilmour in 1956.

Answering Mr. Robertson Crichton, Q.C., for King, the inspector agreed that King had an excellent character, held a position of responsibility and had been helpful in the inquiries.

In reply to Mr. J. Cantley, Q.C., for Arthur Smith, the inspector said that Arthur Smith's attitude was, "Whatever I have had from Gilmour I have given value for," meaning that he had done surveying work.

Mr. Justice Streatfeild rejected a submission by the defendants' Counsel that the prosecution had not made out a case. Counsel for Gilmour and Cyril Smith decided to call no witnesses.

King was questioned by his Counsel. He said that he had been with Metropolitan-Vickers since 1904 and that he spent between £20 and £25 million a year on behalf of the company; his staff sent out about five hundred orders a day. The employment of contractors was on the recommendation of the works engineer. King said that Gilmour had a high reputation for his work and had never asked him for any favour in the placing of contracts. He had asked four times for a bill for the decoration of his home but Gilmour had not given him one.

On Monday last, continuing his evidence, King stated that his salary was £3,000 a year and he would receive about a third of that upon retirement.

Mr. A. C. Main, director of manufacturing, Metropolitan-Vickers, said that he had known King for 25 years and was convinced of his integrity. He also had confidence in Cyril Smith whom he had known for 10 years. Gilmour had a good reputation with Metropolitan-Vickers.

The Judge intervened to say that if the jury were satisfied that King intended to pay for the decorations at his house he had a complete answer to the charges. After a very brief retirement the jury found King not guilty and he was acquitted.

Upon the resumption of the proceedings Arthur Smith said that he had done certain work for Gilmour and anything Gilmour had obtained for him was set off against his accounts.

Food Factory Installations

In the article under the above heading in the *Electrical Review* of 15th February the "exploded" motor shown in illustration 5 was described as a s.c. motor, meaning, of course, squirrel cage, not surface cooled for such an application.

New E.A.W. Branch

The inaugural meeting of the Crawley and Horsham District of the Electrical Association for Women was held on 18th February, when the chair was taken by Councillor Robert May, J.P., chairman of the Crawley Urban District Council. Officers of the new Branch are: Chairman, Councillor Mrs. H. C. Carman, J.P.; hon. secretary, Mrs. Redfern; hon. treasurer, Mrs. Simmons; and magazine secretary, Mrs. Avery.

Hydro-Electric Plant for Spain

The British Thomson-Houston Co., Ltd., has secured an order valued at over £2,500,000 for the supply of hydro-electric plant for the Belesar and Eume power stations of Fuerzas Electricas del Noroeste, S.A. (Fenosa) of Coruna, Spain. For both stations the plant to be supplied includes water turbines, sub-contracted to Boving & Co., Ltd., waterwheel generators, with associated transformers, 220 kV and 132 kV switchgear and power station switchgear and control gear.

Belesar will comprise three 88,000 kVA, 11 kV, 214 r.p.m. vertical generators, driven by 104,800 h.p. Francis type turbines. The output of the generators will be stepped up for distribution at 132 kV in Fenosa's system in Galicia, and for export at 220 kV to the centre of Spain. The outgoing circuits will have B.T.H. air-blast circuit-breakers at 220 kV and bulk oil-breakers at 132 kV.

At Eume power station two 32,000 kVA, 11 kV, 600 r.p.m. vertical generating units will be installed, also driven by Francis turbines. This station is between Coruna and Ferrol and the generator output will be stepped up for distribution in the 132 kV network. The B.T.H. Co. will supply the transformers, switchgear, and control gear associated with this power station.

The order also covers 132 kV and 66 kV oil circuit-breakers, and step-down transformers for the extension of a B.T.H.-equipped substation at El Troncal, near Vigo.

British Refrigeration Association

The annual luncheon of the British Refrigeration Association will be held on 22nd March at the Connaught Rooms, Great Queen Street, London, W.C.2. The guests will include Sir Eric Harrison, High Commissioner for Australia.

Trade Announcements

H. Clarke & Co. (Manchester), Ltd., Manchester, announce the following changes in their sales representation:—Mr. R. M. King will be responsible for Northamptonshire, Bedfordshire, Cambridgeshire, Norfolk, Suffolk, Essex and Hertfordshire, in addition to sections of the London area, and Mr. P. G. Robinson will be based on Birmingham, covering the Birmingham area, Warwickshire, Worcestershire, Staffordshire and Shropshire.

Sunbeam Electric, Ltd., is centralising its administration at its new factory and office building at Nerston, East Kilbride, Glasgow. The move becomes effective as from to-day (Friday). A London sales office, service station and warehouse facilities will be maintained at 14-16, Old Quebec Street, Marble Arch, W.1.

The **Ransome & Marles Bearing Co., Ltd.,** wishes to draw attention to the fact that its Leeds branch is no longer at Norwich Union Buildings, but at St. Paul's House, St. Paul's Street, Leeds. The telephone number is now 32094-5.

Mr. R. Watkins has been appointed to represent the **Cambridge Instrument Co., Ltd.,** in Scotland. His address is 7, Norfolk Court, Norfolk Street, Glasgow (telephone: South 0349), and he will handle all inquiries regarding new instruments. Mr. S. J. Steel will continue to deal with all matters relating to repairs and service.

Standard Telephones & Cables, Ltd., is opening on 4th March a cable depot and warehouse at 33, Pilcher Gate, Nottingham (telephone: Nottingham 52333), under the management of Mr. R. N. Baylis.

The address of the headquarters and administrative offices of the **Stella Lamp Co., Ltd.,** is now 158-160, Shaftesbury Avenue, London, W.C.2 (telephone: Covent Garden 3031).

The address of the Southampton branch office of **British Insulated Callender's Cables, Ltd.,** is now 16-17, Vincent's Walk, Southampton. The telephone number (Southampton 26176/7) remains unchanged.

OVERSEAS ELECTRICAL TRADE

Fall in Exports of Plant and Cables

THE value of United Kingdom exports of electrical goods and apparatus in January was only slightly higher than the figure for December which had fewer working days, but it was considerably below the figure for January, 1956. The total value for January this year was just under £17 million, and compares with £16·4 million in December and £18·9 million in January last year. Practically the whole of the fall, as compared with January, 1956, was due to reduced shipments of heavy electrical equipment, the value of exports of generating sets, generators and motors, declining from £3·5 million to £2·4 million and converting machinery, mercury arc rectifiers, transformers, switchgear, etc., from £2·8 million to £1·9 million. There was also a fall of over £500,000 in shipments of cables and wires, from £3·2 million to £2·7 million.

Two groups which showed an improvement on January of last year were radio apparatus, exports of which rose from £2·5 million to £2·7 million, and telegraph and telephone equipment which rose by nearly £250,000 to £1·8 million.

It will be seen from Table I that there has been some revision in the list of goods, some of the lesser items, such as electric bell apparatus and industrial radio-frequency

TABLE I.—ELECTRICAL EXPORTS

Class	January, 1956	January, 1957
	£	£
Generating sets and generators:		
Diesel-driven, up to 10 kW	114,715	148,120
Ditto, 10 to 65 kW	118,210	137,802
Ditto, 65 to 200 kW	150,046	75,832
Ditto, over 200 kW	448,932	242,379
Spark ignition engine driven	70,897	9,834
Steam turbine driven	15,049	24,818
Hydraulic turbine driven	51,786	—
Other prime mover driven	69,371	10,781
Generators, not exceeding 200 kW	189,806	205,644
Ditto, over 200 kW	97,356	31,479
Parts of generators	922,391	308,337
Motors, complete, other than railway, tramway and trolley-bus:		
Up to ¼ h.p.	186,974	181,765
Over ¼ but under 1 h.p.	75,771	42,076
1 h.p. to 250 h.p.	461,425	458,509
Over 250 h.p.	83,609	160,182
Railway, tramway and trolley-bus motors complete and parts of all motors	207,675	153,797
Motor starting and controlling gear	223,172	241,617
	3,487,185	2,432,972
Converting machinery	31,428	131,285
Mercury-arc rectifiers	55,928	31,884
Transformers for lighting, heating and power (incl. coils):		
Not exceeding 7,500 kVA	1,150,190	{ 358,844
Over 7,500 kVA		{ 202,023
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	199,593	263,731
Ditto, other	1,377,328	906,353
	2,814,467	1,894,120
Primary batteries:		
Lighting	84,627	95,532
Radio	223,290	308,942
Other	51,770	36,386
Parts (excl. carbons)	46,717	48,042
Lamps:		
Filament, exceeding 28 V*	95,602	74,293
Ditto, under 28 V*	30,984	31,495
Arc lamps and searchlights	20,888	11,268
Discharge lamps, fluorescent tubes, etc.	79,581	94,250
Radio and television, etc., apparatus:		
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	32,632	24,011
All other	227,164	241,525
Parts (excluding glass bulbs)	10,677	7,869
Radio and television transmitters	68,693	93,101
Commercial radio and radar equipment	1,014,325	1,095,124
Domestic radio receivers, mains	158,153	97,720
Ditto, battery	92,849	47,028
Ditto, other (incl. car)	32,141	26,336
Radiograms	44,455	21,881
Television sets	76,630	70,758
Public address equipment	82,950	101,979
Other radio and television apparatus, n.e.s.	39,760	64,426
Components and parts, n.e.s.	663,579	773,451
	2,544,008	2,665,209
Telegraph and telephone installations	840,090	818,059
Telephone instruments, separately consigned	104,301	138,592
Telegraph and telephone parts	570,980	758,544
Line apparatus for long distance communication	90,771	130,556
	1,606,142	1,845,751

Class	January, 1956	January, 1957
	£	£
Cookers	90,875	57,170
Toasters	12,852	14,911
Other cooking apparatus	39,657	26,131
Parts and accessories	72,646	72,111
Space heating appliances	61,165	38,538
Water heating appliances	27,771	22,933
Other heating appliances	27,696	31,393
Parts and accessories	65,634	60,242
Irons	121,060	61,220
Arc welding equipment, a.c.	47,067	50,827
Ditto, d.c.	45,828	48,785
Resistance welding equipment	12,104	16,303
Electric furnace plant	64,330	108,986
Magnetos, ignition	38,551	38,089
Sparking plugs	159,977	174,802
Elec. appliances for aeroplanes, n.e.s.	194,366	230,263
Ditto, for motor vehicles, n.e.s.	325,334	318,810
Ditto, for cycles, n.e.s.	83,425	38,692
Signalling app. (incl. traffic signals)	48,049	84,752
Instruments, commercial	172,425	162,426
House service meters (including parts)	171,044	147,683
Electro-medical apparatus (not X-ray)	65,621	29,181
X-ray apparatus (excl. tubes and valves)	63,036	59,979
Vacuum tubes	19,762	27,019
Ceiling fans, complete	71,445	98,152
Desk fans, complete and parts of desk and ceiling fans	22,032	23,683
Vacuum cleaners	100,584	155,956
Floor polishers	96,906	84,628
Food mixers	49,075	54,773
Hair clippers and dry shavers	42,781	133,138
Other portable appliances	29,993	29,632
Parts	82,957	132,302
Portable elec. tools (not saws) and parts	174,664	207,246
Cables and wires:		
Telegraph and telephone, submarine	78,282	89,758
Ditto, other	542,741	1,029,064
Cotton, silk or art. silk insulated	41,008	31,109
Enamel, glass or asbestos insulated	81,205	82,793
Paper insulated	1,456,903	512,864
Rubber insulated	566,351	613,984
Thermoplastic insulated	116,433	141,169
Other	304,021	165,070
	3,186,944	2,665,811
Accumulators for motor vehicles	211,009	121,209
Ditto, traction	10,477	32,478
Ditto, radio and other portable	71,299	63,944
Ditto, other	67,267	31,754
Parts and accessories	105,707	108,955
Elec. porcelain, etc. (incl. insulators), n.e.s.	84,856	102,641
Insulating cloth and tape	74,514	72,664
Other insulating material	93,974	100,902
Permanent magnets	38,272	40,309
Radio, telegraph and telephone testing equip., n.e.s.	32,346	38,647
Scientific elec. instruments (not telegraphic or telephonic):		
Time recorders and time switches, complete	10,312	14,253
Other	197,238	339,328
Electrical machinery, n.e.s.	124,667	58,305
Electrical apparatus and appliances, n.e.s.	810,504	819,547
TOTAL	18,905,359	16,989,763

* The figures for 1957 are not completely comparable with those for previous years

equipment being omitted, while one or two items have been reclassified.

India, with purchases of £325,350, was the principal customer for generating plant and motors in January, followed by Canada which imported equipment valued at £298,425, and South Africa with £233,397. The principal market for converting machinery, mercury arc rectifiers, etc., was India which took plant valued at £409,861. Second place was taken by Australia (£308,527), and South Africa was third with £265,360.

In the radio apparatus group, the best Commonwealth market was Australia with imports of £202,568, the next in order of importance being India (£156,124) and Canada (£137,076). Outside the Commonwealth, France took apparatus valued at £178,096, and the Netherlands £155,570.

New Zealand took first place in the purchases of telegraph and telephone equipment with imports of £296,956, followed closely by South Africa with £261,268 and Australia with £250,024. The two principal Commonwealth importing countries of wires and cables were India which purchased £403,890 worth and New Zealand with a value of £310,178. Outside the Commonwealth, the United States bought cable valued at £400,615.

In addition to the items given in Table I, electrical equipment shown elsewhere in the Board of Trade returns includes the following. January, 1956, figures are given in parentheses:—

Electrically operated washing machines, complete, not exceeding 150 lb net weight, £384,457 (£273,952); ditto, 150-250 lb net weight, £99,434 (£95,790). Parts, £52,537 (£60,690).

Electric light fittings and lanterns, complete, with or without bulbs (excluding arc lamps, electric searchlights and cycle lamps), £176,258 (£141,734).

Electric carbons, including parts, £62,003 (£56,674). Welding electrodes (excluding carbon), covered, £105,678 (£128,004). Electric conduit tubes and cased tubes, £77,114 (£58,690).

Electric locomotives, £378,432 (£229,428). I.c. engine locomotives with electrical transmission, £182,987 (£678,806).

The distribution of exports of the classes of electrical machinery and apparatus shown in Table I is indicated in Table II.

TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	January, 1956	January, 1957
	£	£
Channel Islands	96,073	95,476
Gibraltar	16,584	10,878
Malta and Gozo	82,994	34,004
Cyprus	71,152	128,462
Sierra Leone	22,033	38,725
Gold Coast	142,436	187,881
Nigeria	401,802	332,195
Union of South Africa	1,535,917	1,415,619
Rhodesia and Nyasaland	689,672	505,651
Tanganyika	93,414	38,929
Kenya	287,243	124,864
Uganda	59,698	62,791
Mauritius	18,311	21,366
Aden	53,655	30,703
Bahrain, Qatar and Trucial States	104,925	5,768
Kuwait	109,491	71,611
India	2,017,702	1,759,312
Pakistan	415,925	141,580
Singapore	309,361	365,063
Federation of Malaya	232,704	357,419
Ceylon	142,089	170,119
British North Borneo	75,105	9,632
Sarawak	26,199	31,683
Hong Kong	174,141	292,614
Australia	1,738,162	1,483,604
New Zealand	762,705	1,039,738
Fiji	15,463	19,661
Canada	748,931	923,566
Jamaica	122,577	58,742
Barbados	37,716	22,988
Trinidad	129,019	95,720
British Guiana	46,514	46,427
Other Commonwealth countries	65,697	109,938
Irish Republic	308,705	218,090
Soviet Union	495,830	145,287
Finland	133,819	114,087
Sweden	293,514	313,274
Norway	176,248	222,385
Iceland	29,513	5,697
Denmark	130,258	130,779
Poland	46,793	31,519
Western Germany	180,267	251,991
Netherlands	531,199	666,134
Belgium	269,509	331,126
France	261,692	399,987
Switzerland	91,051	128,912
Portugal	187,705	199,198
Spain	225,297	379,310
Italy	292,604	290,441
Austria	19,409	20,650
Yugoslavia	42,590	26,897
Greece	97,532	78,577
Turkey	26,314	11,902
Belgian Congo	41,487	43,421
Portuguese East Africa	21,617	25,177
Egypt	183,909	551
Libya	15,026	16,607
Southern Morocco	44,500	59,515
Sudan	70,879	148,358
Syria	46,963	48,065
Lebanon	43,113	37,782
Israel	92,075	64,703
Jordan	90,811	62,157
Saudi Arabia	39,926	40,542
Iraq	305,469	273,370
Iran	190,950	233,971
Burma	206,012	46,[illegible]
Thailand	128,412	73,[illegible]
Indonesia	67,827	102,53[illegible]
Japan	37,217	54,934
United States of America	1,008,634	691,794
Cuba	28,807	38,115
Mexico	72,090	57,034
Colombia	168,481	46,896
Venezuela	613,698	347,956
Peru	45,226	70,077
Chile	39,636	29,284
Brazil	261,564	37,008
Uruguay	11,253	20,546
Argentine Republic	51,184	71,437
Other foreign countries	293,334	249,297
TOTAL	18,905,359	16,989,763

Electrical Imports

In January imports of electrical machinery and apparatus totalled £2,255,456 in value, as compared with £1,825,460 in December and £1,873,329 in January, 1956. The three principal supplying countries were the United States which sent goods valued at £776,165, Western Germany with £374,749, and the Netherlands, £264,175. As for some time past the principal class of imports was radio and electronic equipment.

School Installation

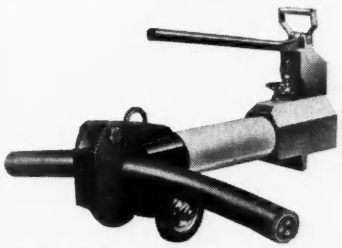
CHRIST'S HOSPITAL, which under its original name of Grey Friars, was founded in London in 1552 for the education of boys and girls, was moved to Horsham at the beginning of the present century. The site of some 600 acres includes the school and ancillary buildings, farm, private residences, estate office and buildings. Last year the school's own generating plant was replaced by a supply from the South Eastern Electricity Board.

When built in Horsham, the whole of the property was equipped for electricity, and a steam generating plant was installed. This ran for over fifty years and was still in good running order when the change-over took place. The equipment comprised three Davey Paxman twin-cylinder steam engines direct-coupled to E.C.C. 220 V d.c. two-wire generators with Lancashire boilers steaming at 180 lb/sq in. The steam exhausted from the engines was passed through calorifiers to supply a part of the hot water for the school, and thus provided an early example of the efficient use of steam. We thank Mr. R. B. Giles, consulting engineer, for sending us a reprint from the *E.C.C. Institute News* from which we have obtained this information.

NEW ELECTRICAL EQUIPMENT

Hydraulic Shear

The "Carricut" portable self-powered hydraulic shear manufactured by COPELAW, LTD., Mowden Hall, Darlington, Co. Durham, is claimed to be of unique design. It can be taken single-handed to the work and will cut steel or iron rods, wire ropes, cables and chains quickly and cleanly, without flash, by arm-power alone and is especially suitable for use in mines, ships, constructional and electrical engineering. There are five models, ranging in weight from 53 to 297 lb. The largest of these, the B.50, is available with or without remote control and cuts wire ropes of up to 2in diameter and electric cables up to 3¼in diameter.

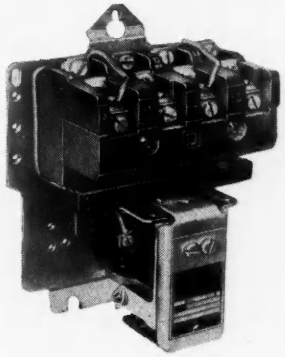


Copelaw B.50 "Carricut" hydraulic shear

Magnetic Contactors

A.c. magnetic contactors designed particularly for motor loads where overload protection is either not required or is provided separately, are now available from SQUARE D, LTD., 100, Aldersgate Street, London, E.C.1.

All components of Class 8502 contactors are front mounted. Maintenance can be carried out without removing the contactor from its enclosure and contacts can be replaced without disturbing either the line or the load wiring. The double-break silver contacts do not corrode or need cleaning.



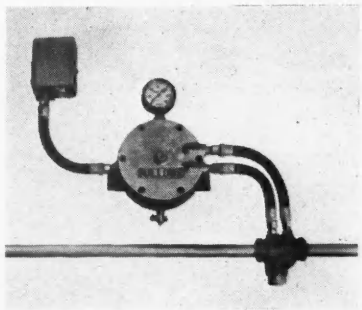
Square D magnetic contactor, Type FO-2

To ensure cool operation, moulded coils with a high rate of heat transfer are used. This type of coil will operate the contactors satisfactorily on line voltage fluctuations as much as 15 per cent below and 10 per cent above normal. To minimise a.c. hum, two shading coils are embedded in the magnet frame.

Contactors can be supplied as open or enclosed types with 2, 3 or 4 poles. Auxiliary switches can be added to suit almost every need and "start-stop" push-buttons or "hand-off-auto" selector switches can be easily fitted in the covers of enclosed contactors from readily available packaged kits.

Fan Control Unit

An automatic fan control unit, Type V1001/2, announced by ALFRED BULLOWS & SONS, LTD., Long Street, Walsall, is designed for workshops with spray booths, switching the fan off when the spray gun is not in use and on again within 2 sec after spraying restarts. In this way there is a substantial reduction in heat losses.



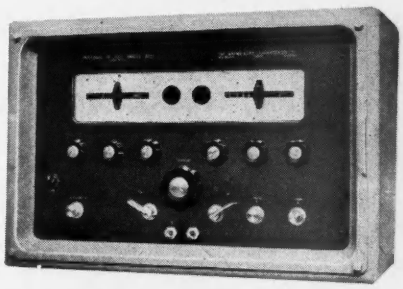
Bullows automatic fan control unit

The switchgear for use with the fan control unit must be suitable for automatic operation, and will normally need to be changed to the automatic type when the unit is installed.

Universal Bridge

A transformer ratio arm bridge of advanced design has been produced by WAYNE KERR LABORATORIES, LTD., Sycamore Grove, New Malden, Surrey. It provides facilities for the two-, three- or four-terminal measurement of impedance or transfer admittance over a wide range at an operating frequency of 10,000 radians/sec (1,592 c/s).

Measurement is unaffected by the impedance of the test leads and consequently the instrument is ideally suitable for the determination of temperature coefficient of components under test conditions or any remote *in situ* measurement.



Wayne Kerr Type B221 universal bridge

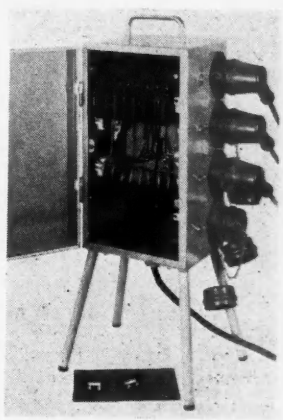
A novel mechanism automatically gives direct reading and avoids any confusion which might be caused by the large multiplying factors involved.

The basic range of the instrument covers impedances from 10,000 megohms to 10 ohms and this is extended to 50 micro-ohms by the use of a low impedance adaptor. Other adaptors have been designed for the measurement of conductivity, dielectric constant and loss factor of solids and liquids.

Portable Distribution Box

The latest addition to the range of products manufactured by NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe, Manchester, 22, is a portable distribution box. The unit comprises a steel case with hinged front, mounted on four legs with rubber feet. A carrying handle is provided at the top of the box and the socket outlets consist of eight 5 A rubber-clad batten sockets, four to each side. A d.p. switch controls each outlet and the sockets are fitted with an angle type rubber-clad 5 A plug, and also a rubber cap for closing off the outlet when not in use.

Internally there are two 8-way d.p. banks, one of which is fitted with 5 A h.r.c. fuses and the other with solid neutral links. There is also an 8-way earthing bar with main terminal. The mains supply is brought in through a cable gland at the base of the case. The finish is in silver or bronze stoved enamel.



Nettle Accessories portable distribution box

DOMESTIC ELECTRICAL EQUIPMENT — Kettles and Percolators

IN this survey we deal with both electric kettles and coffee percolators, two items of domestic electrical equipment in which the efficiency and convenience of electricity are perhaps more apparent than in any other appliance. Apart from speed of operation, they have the advantage of complete cleanliness which permits them, if desired, to be used on the dining table, sideboard, etc. Electric kettles nowadays all conform to a more or less standard pattern and use the immersion type element. The average loading is either 1,250 or 1,500 W but more manufacturers are introducing models fitted with the speedier 2 kW element.

Safety cut-outs, either self-resetting or of the ejector type, are fitted to practically all makes to protect the elements should the kettle be switched on when empty, or allowed to boil dry.

Most kettles are either of chromium-plated copper or polished aluminium, but for those who prefer colour in the kitchen there are the Revo " Cumberland " with its red Bakelite handle, the golden coloured anodised aluminium kettle made by Buncher & Haseler, Ltd., F. J. Tomlinson's " Marchioness " in red, blue or green, or Best Products' latest introduction, the " Herald " alarm kettle in a range of five colours. Bulpitt & Sons have added the " Siren " 3-pint 2 kW whistling kettle to their wide range.

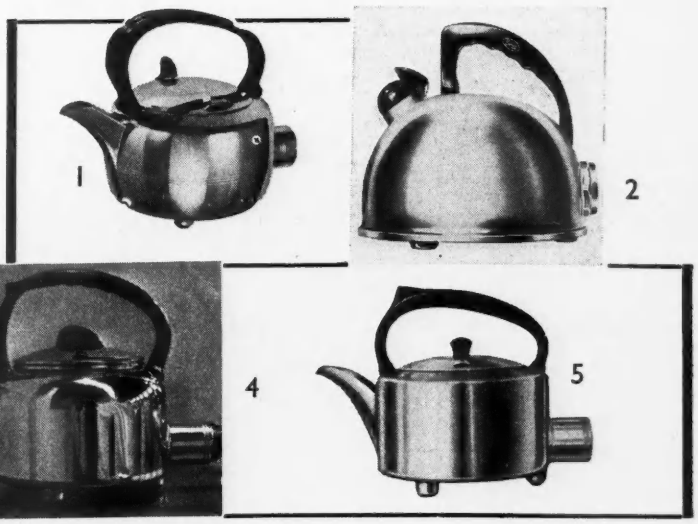
The majority of electric coffee percolators are of copper, finished in chromium, with heat-resisting moulded handles and bases. Many pleasing designs are available and some manufacturers favour the use of a porcelain body which, it is claimed, helps to retain the full coffee flavour. The average capacity is between 1½ and 2 pints, or sufficient for from six to eight coffee cups. Both automatic and non-automatic types may be obtained, the former being fitted with an additional element which keeps the coffee hot after percolation has been completed.

KETTLES

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BESCOL (ELECTRIC), LTD., 118, Parkfield Road, Saltley, Birmingham, 8.	" Elephant " 208	3 pint	1,500 W and 2,000 W	Chromium plated copper	Black Bakelite	Thermostatic safety device	£3 19 6 (1½ kW) £4 0 6 (2 kW)	£0 17 5 (1½ kW) £0 17 8 (2 kW)
	" Elephant " 214	3½ pint	1,500 W and 2,000 W	Polished aluminium	Black Bakelite	Thermostatic safety device	£2 18 6 (1½ kW) £2 19 6 (2 kW)	£0 12 10 (1½ kW) £0 13 0 (2 kW)
	" Mysto Maid " 2006	3½ pint	1,500 W and 2,000 W	Chromium plated copper	Black Bakelite	Thermostatic safety device	£4 0 6 (1½ kW) £4 1 6 (2 kW)	£0 17 8 (1½ kW) £0 17 11 (2 kW)
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk.	" Fanfare "	4 pint	1,500 W with cut-out	Chromium plated copper (a) and polished lacquered copper (b)	Black Bakelite	Organ toned musical alarm	£4 15 0 (a) £4 7 6 (b)	£1 0 10 (a) £0 19 2 (b)
	" Fanfare "	4 pint	1,500 W with cut-out	Chromium plated copper	Coloured handle and alarm cap	Organ toned musical alarm	£4 15 0	£1 0 10
	" Family "	3 pint	1,250 W and 1,500 W	Chromium plated copper	Bakelite (range of 5 colours)	Safety lid engagement	£3 17 6 (1,250 W) £3 19 6 (1,500 W)	£0 17 0 (1,250 W) £0 17 5 (1,500 W)
	" Family "	3 pint	1,250 W and 1,500 W	Enamelled copper (range of 4 colours)	Black Bakelite	Safety lid engagement	£3 17 6 (1,250 W) £3 19 6 (1,500 W)	£0 17 0 (1,250 W) £0 17 5 (1,500 W)
	" Jiffy "	2 pint	1,250 W	Chromium plated copper	Black Bakelite	Fast boiling, handle fixing prevents steam damage	£3 12 6	£0 15 10
	" Herald "	4 pint	1,500 W	Anodised aluminium (range of 5 colours)	Black Bakelite	Organ toned musical alarm	£2 17 0	£0 12 6
BULPITT & SONS, LTD., Icknield Street, Birmingham, 18.	" Kitchen " 200	3½ pint	1,000 W	Brown vitreous enamel	Vitreous enamel	—	£2 13 11	£0 11 10
	" Kitchen " 205	3½ pint	1,500 W	Brown vitreous enamel	Vitreous enamel	—	£2 16 0	£0 12 3

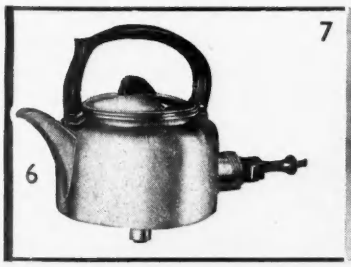
Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BULPITT & SONS, LTD., Icknield Street, Birmingham, 18. *(continued)*	"Kitchen" C.200	3½ pint	1,000 W	Cream and green vitreous enamel	Vitreous enamel	—	£2 18 1	£0 12 8
	"Kitchen" C.205	3½ pint	1,500 W	Cream and green vitreous enamel	Vitreous enamel	—	£3 0 1	£0 13 2
	"Royal" CH.102	2 pint	850 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 8 1	£0 14 11
	"Royal" CH.103	3 pint	1,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 17 6	£0 17 0
	"Royal" CH.103A	3 pint	1,500 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 19 7	£0 17 5
	"Royal" CH.105	5 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£4 12 6	£1 0 3
	"Popular" C.223	3 pint	1,000 W	Polished copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 6 5	£0 14 7
	"Popular" C.223A	3 pint	1,500 W	Polished copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 8 6	£0 15 0
	"Popular" C.226	6 pint	2,000 W	Polished copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£4 3 5	£0 18 4
	"Popular" CH.223	3 pint	1,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 14 0	£0 16 3
	"Popular" CH.223A	3 pint	1,500 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 16 1	£0 16 8

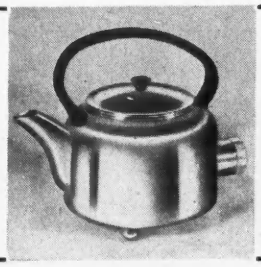
1. *Bulpitt "Royal"*
2. *Best Products "Herald" alarm kettle*
3. *Best Products "Family" 3 pint kettle*
4. *Bescol "Mysto-Maid" 2006*
5. *Bescol "Elephant" 208*

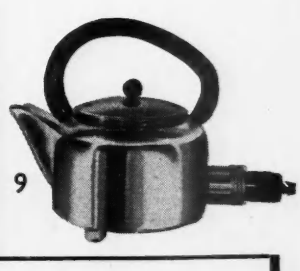


Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BULPITT & SONS, LTD., Icknield Street, Birmingham, 18. *(continued)*	"Popular" CH.224A	4 pint	1,500 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£4 3 5	£0 18 4
	"Popular" CH.224B	4 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£4 5 11	£0 18 10
	"Popular" CH.226	6 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vents	£4 12 6	£1 0 3
	"Popular" A.223	3 pint	1,000 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vents	£2 15 7	£0 12 2
	"Popular" A.223A	3 pint	1,500 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vents	£2 17 7	£0 12 8
	"Popular" A.224A	4 pint	1,500 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 3 2	£0 13 10
	"Popular" A.224B	4 pint	2,000 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 5 7	£0 14 5
	"Popular" A.226	6 pint	2,000 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vents	£3 8 11	£0 15 1
	Kettle and Saucepan CH.353	Kettle: 3 pint Inner Pan: 1½ pint	2-heat 1,000/125 W	Chromium plated copper. Aluminium pan	Heat insulated moulded plastic	Hinged kettle handle	£4 17 5	£1 1 4
	"Siren" CH.440	3 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Trigger action lid with built-in whistle	£4 18 5	£1 1 7
BUNCHER & HASELER, LTD., Branston Street, Birmingham, 18.	877	6 pint	2,000 W	Polished aluminium	Black plastic	—	£3 12 6	£0 15 11
	"Golden Glimmer" 872	4 pint	1,500 W	Gold coloured anodised aluminium	Black plastic	—	£3 9 9	£0 15 3
CHALFONT ELECTRICAL PRODUCTS, LTD., Tyrrell Street, Leicester.	"Streamline"	4 pint	1,500 W	Polished aluminium	Moulded plastic	All welded construction	£2 17 6	£0 12 7
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley, Worcs.	"C.W.S. Dudley"	4 pint	1,250 W	Polished aluminium	Black Bakelite	—	£2 15 0	£0 12 1
	"C.W.S. Dudley"	4 pint	1,500 W	Polished aluminium	Black Bakelite	—	£2 17 0	£0 12 6
	"C.W.S. Dudley"	4 pint	1,250 W	Vitreous enamel	Vitreous enamel	—	£2 16 0	£0 12 3
DEPENDABLE PRODUCTS, LTD., Queensway, Team Valley Trading Estate, Gateshead, 11.	"Standard"	3½ pint	1,500 W	Aluminium (a) and Chromium (b)	Moulded plastic	—	£3 1 3 (a) £3 10 0 (b)	£0 13 5 (a) £0 15 4 (b)
	"Queensway"	3½ pint	1,500 W	Aluminium (a) and Chromium (b)	Moulded plastic	—	£3 8 5 (a) £3 17 0 (b)	£0 15 1 (a) £0 16 11 (b)
EASIPOWER, LTD., 213-215, Gloucester Place, London, N.W.1.	A.K.S.	3½–4 pint	1,500 W	Polished aluminium	Steel reinforced plastic	Streamlined	£2 19 6	£0 13 0
	C.K.	3½–4 pint	1,500 W	Chromium plated copper	Steel reinforced plastic	Streamlined	£3 15 0	£0 16 6

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
ELGA PRODUCTS, LTD., Railway Place, Wimbledon, S.W.19.	"Conquest" A.5	3½ pint	1,000 W	Aluminium	Steel reinforced plastic	Large lid, fast pouring spout	£2 19 0	£0 13 0
	"Conquest" A.10	3½ pint	1,500 W	Aluminium	Steel reinforced plastic	Large lid, fast pouring spout	£3 1 0	£0 13 5
	"Conquest" A.12	3½ pint	2,000 W	Aluminium	Steel reinforced plastic	Large lid, fast pouring spout	£3 3 0	£0 13 10
	"Conquest" A.15	3½ pint	1,000 W	Chromium plated copper	Steel reinforced plastic	Large lid, fast pouring spout	£3 17 6	£0 17 0
	"Conquest" A.20	3½ pint	1,500 W	Chromium plated copper	Steel reinforced plastic	Large lid, fast pouring spout	£3 19 6	£0 17 5
	"Conquest" A.22	3½ pint	2,000 W	Chromium plated copper	Steel reinforced plastic	Large lid, fast pouring spout	£4 2 0	£0 18 0
	"Rainbow" A.11	3½ pint	1,500 W	Anodised aluminium, red, blue and green	Steel reinforced plastic	Large lid, fast pouring spout	£3 9 0	£0 15 2
ELTRON (LONDON), LTD., Strathmore Road, Croydon, Surrey.	"Combinax"	2 pint	500, 700 and 1,000 W	Polished aluminium	Black Bakelite	Removable element	£1 14 0 (500 W) £1 17 0 (700 W) £2 5 0 (1,000 W)	£0 7 8 (500 W) £0 8 4 (700 W) £0 10 1 (1,000 W)
	Car Kettle	1½ pint	—	Polished aluminium	Black Bakelite	For use on 12 V car battery	£1 15 0	£0 2 3
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"Teatime" U.95696	4 pint	1,000 or 1,500 W	Chromium plated copper	Heat resisting plastic	Large lid, fast pouring spout	£3 17 0	£0 16 11
	"Teatime" U.95697	4 pint	1,500 W	Polished aluminium	Heat resisting plastic	Large lid, fast pouring spout	£2 18 0	£0 12 9
	"Cleanline" U.95634	4 pint	1,500 W	Anodised aluminium, red, blue and green	Moulded plastic	—	£3 9 0	£0 15 2
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.	D.5173	3 pint	2,000 W	Polished aluminium	Heat insulated plastic	Super-speed boiling	£2 19 6	£0 13 1
	D.5175	5 pint	2,000 W	Polished aluminium	Heat insulated plastic	Super-speed boiling	£3 8 0	£0 14 11
	D.5183	3 pint	2,000 W	Polished aluminium	Heat insulated plastic	Super-speed boiling, corrosion resistant	£3 3 0	£0 13 10







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6. *Easipower model C.K. kettle*
7. *Falk, Stadelmann "Teatime" U.95697*
8. *Chalfont "Streamline"*
9. *Elga Products "Conquest"*
10. *Buncher & Haseler "Golden Glimmer" 872*
11. *Bulpitt "Siren" whistling kettle*
12. *C.W.S. "Dudley" 4 pint aluminium kettle*

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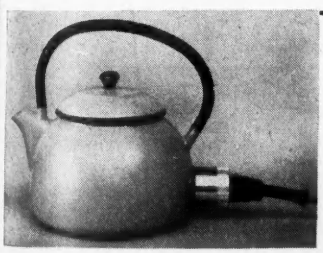
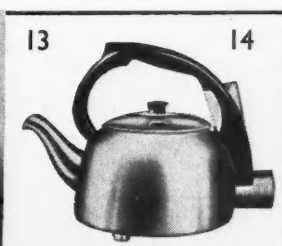
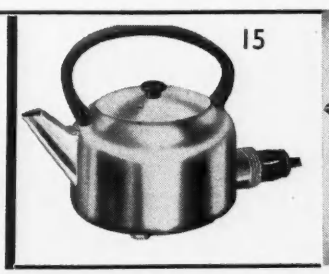
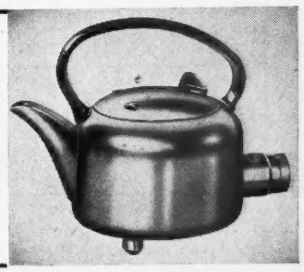
Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. *(continued)*	D.5185	5 pint	2,000 W	Polished aluminium	Heat insulated plastic	Super-speed boiling, corrosion resistant	£3 11 6	£0 15 8
	D.5235	5 pint	2,000 W	Chromium plated copper	Heat insulated plastic	Super-speed boiling	£4 19 6	£1 1 10
	D.5235A	3 pint	2,000 W	Chromium plated copper	Heat insulated plastic	Super-speed boiling	£4 2 6	£0 18 1
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2.	L.G.H.707	3½ pint	1,500 W	Polished aluminium	Steel with plastic grip	Automatic	£2 19 6	£0 13 0
	L.G.H.565	3½ pint	1,500 W	Polished aluminium	Steel with plastic grip	Automatic	£3 7 6	£0 14 10
	L.G.H.66	3½ pint	1,500 W	Chromium plated copper	Steel with plastic grip	Automatic	£3 19 6	£0 17 6
	L.G.H.202	2 pint	750 W	Polished aluminium	Metal	Non-automatic	£1 12 9	£0 7 2
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, W.C.2.	"Torribar" H.K.140	3 pint	1,500 W	Polished aluminium	Plastic on metal brackets	Safety cut-out	£3 2 6	£0 13 9
	"Torribar" H.K.150	3 pint	1,500 W	Chromium plated copper	Plastic on metal brackets	Safety cut-out	£4 1 6	£0 17 11
	"Torribar" H.K.160	4 pint	1,500 W	Chromium plated copper	Plastic on metal brackets	Safety cut-out	£4 12 6	£1 0 4
	Premier "Pylon" 2939S, 2939 and 2939A	3 pint	2,000 W (2939S), 1,500 W (2939) and 1,000 W (2939A)	Chromium plated copper	Moulded plastic	Safety cut-out	£4 1 6 (2939S) £3 19 6 (2939) £3 17 6 (2939A)	£0 17 11 (2939S) £0 17 6 (2939) £0 17 0 (2939A)
	Premier "Pylon" 2947S and 2947	4½ pint	2,000 W (2947S) and 1,500 W (2947)	Chromium plated copper	Moulded plastic	Safety cut-out	£4 12 6 (2947S) £4 10 6 (2947)	£1 0 4 (2947S) £0 19 11 (2947)
	Premier "Pylon" 2833S, 2833 and 2833A	3 pint	2,000 W (2833S), 1,500 W (2833) and 1,000 W (2833A)	Polished aluminium	Moulded plastic	Safety cut-out	£2 19 6 (2833S) £2 17 6 (2833) £2 15 6 (2833A)	£0 13 1 (2833S) £0 12 8 (2833) £0 12 3 (2833A)
	Premier "Pylon" 2837S, 2837 and 2837A	3 pint	2,000 W (2837S), 1,500 W (2837) and 1,000 W (2837A)	Polished copper, lacquered	Moulded plastic	Safety cut-out	£4 1 6 (2837S) £3 19 6 (2837) £3 17 6 (2837A)	£0 17 11 (2837S) £0 17 6 (2837) £0 17 0 (2837A)
LINCASS ELECTRIC, LTD., Guildford Street, Chertsey, Surrey.	950/951	4 pint	1,000 and 1,500 W	Chromium plated copper	Black Bakelite	—	£3 17 6 (1 kW) £3 19 6 (1½ kW)	£0 17 0 (1 kW) £0 17 5 (1½ kW)
	850/851	4 pint	1,000 and 1,500 W	Polished copper	Black Bakelite	—	£3 10 6 (1 kW) £3 12 6 (1½ kW)	£0 15 5 (1 kW) £0 15 10 (1½ kW)
	780/781	4 pint	1,000 and 1,500 W	Polished aluminium	Black Bakelite	—	£3 2 6 (1 kW) £3 4 6 (1½ kW)	£0 13 8 (1 kW) £0 14 1 (1½ kW)
	770/771	4 pint	1,000 and 1,500 W	Polished aluminium	Black Bakelite	—	£2 15 6 (1 kW) £2 17 6 (1½ kW)	£0 12 1 (1 kW) £0 12 6 (1½ kW)
METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Kemp Town, Brighton, 7.	"Miniway New" DA.389	2 pint	750 W (non-automatic)	Polished aluminium	Moulded plastic	—	£1 18 9	£0 8 5
	"Miniway De-Luxe" DA.429	2 pint	750 W	Polished aluminium	Moulded plastic	—	£2 2 9	£0 9 3
	"Boilaway" DA.559	4 pint	1,500 W	Polished aluminium	Moulded plastic	—	£2 15 9	£0 12 1
	"Boilaway" DA.549	4 pint	1,000 W	Polished aluminium	Moulded plastic	—	£2 14 9	£0 11 10

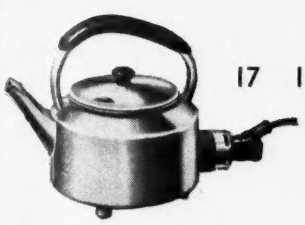
Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Kemp Town, Brighton, 7. *(continued)*	"Fastaway" DA.589	4 pint	1,800 W	Polished aluminium	Moulded plastic	—	£2 18 9	£0 12 9
	"Fastaway" DA.630	4 pint	2,000 W	Polished aluminium	Moulded plastic	—	£3 3 0	£0 13 8
	"Majaway" DA.699	6 pint	2,000 W	Polished aluminium	Moulded plastic	—	£3 9 9	£0 15 1
MIDLAND METAL SPINNING CO., LTD., Tower Works, Pelham Street, Wolverhampton.	"Towerbrite" 5035	3½ pint	1,500 W	Aluminium	Bakelite	"Towerbrite" finish in silver, cut-out	£3 5 0	£0 14 3
	"Towerbrite" 5035G	3½ pint	1,500 W	Aluminium	Bakelite	"Towerbrite" finish in gold, cut-out	£3 10 0	£0 15 4
REVO ELECTRIC CO., LTD., Tipton, Staffs.	"Savoy"	3 pint	2,000 W	Chromium plated copper	Black Bakelite	Quick heating element	£3 19 6	£0 17 6
	"Cumberland"	3 pint	2,000 W	Polished aluminium	Red Bakelite	Quick heating element	£2 18 0	£0 12 9
RUSSELL HOBBS, LTD., 1, Bensham Lane, West Croydon, Surrey.	"Russell Hobbs" K.1.	3½ pint	1,750 W	Chromium plated copper	Moulded plastic	Vapour controlled, switches off when water boils	£4 18 9	£1 1 8
	"Russell Hobbs" K.1.Spa	3½ pint	1,750 W	Anodised aluminium, silver lustre, red, blue or green	Moulded plastic	Vapour controlled, switches off when water boils	£4 1 6	£0 17 11
ERNEST STEVENS, LTD., P.O. Box 2, Cradley Heath.	"Judge" 634	4½ pint	1,500 W	Vitreous enamelled, turquoise with black trim	Steel, vitreous enamelled	Easy to clean, new design, cut-out	£3 8 0	£0 14 11
	"Judge" 638	3½ pint (a) and 4½ pint (b)	1,500 W	Vitreous enamelled silvery green with black trim	Steel, enamelled black	New shape, cut-out	£3 4 9 (a) £3 8 9 (b)	£0 14 2 (a) £0 15 1 (b)

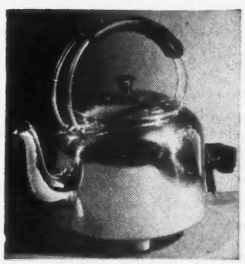


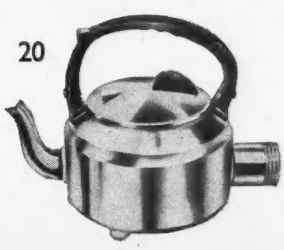




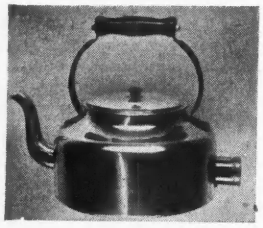








13. *Ernest Stevens "Judge" enamelled kettle*
14. *Russell Hobbs vapour controlled kettle*
15. *Lincass model 950/951*
16. *L. G. Hawkins L.G.H. 707*
17. *Hotpoint "Premier Pylon"*
18. *G.E.C. 3 pint kettle*
19. *Revo "Cumberland"*
20. *Midland Metal Spinning Co.'s "Towerbrite" 5035*
21. *Metway "Miniway De-Luxe" DA.429*
22. *Hotpoint H.K.150 kettle*



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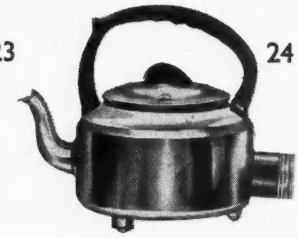

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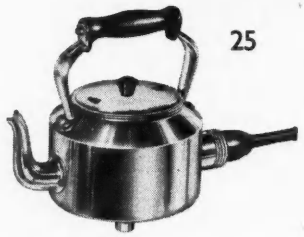

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23. *F. J. Tomlinson's "Countess"*
24. *F. J. Tomlinson's "Marchioness"*
25. *Sun Electrical Co.'s "Sunco" H.5540*

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
ERNEST STEVENS, LTD., P.O. Box 2, Cradley Heath. *(continued)*	"Judge" 633 and 637	3½ pint	1,500 W	Vitreous enamelled, turquoise (633) or silvery green (637)	Steel, enamelled black	Standard shape, cut-out	£2 19 0 (633) £2 19 6 (637)	£0 12 10 (633) £0 13 0 (637)
SUN ELECTRICAL CO., LTD., 118-124, Charing Cross Road, London, W.C.2.	"Sunco" H5540	4 pint	1,250 W	Polished aluminium	Bakelite	—	£2 17 6	£0 12 8
F. J. TOMLINSON, LTD., Hall Carr Mill, Rawtenstall, Lancs.	"Countess"	4 pint	1,500 W or 2,000 W	Polished aluminium	Bakelite and metal	—	£2 9 11	£0 11 3
	"Marchioness"	3½ pint	1,500 W or 2,000 W	Polished aluminium (a), or anodised in red, blue or green (b)	Bakelite	—	£2 17 6 (a) £3 3 0 (b)	£0 12 11 (a) £0 14 3 (b)
	"Baroness"	10 pint	1,500 W	Polished aluminium	Bakelite and metal	—	£3 6 6	£0 15 0

COFFEE PERCOLATORS

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk.	"Best" No. 2	2½ pint	500 W	Chromium on copper or pastel enamel shades	Black Bakelite	Automatic cut-out, indicator lights, pre-set percolation	£5 17 6 (chromium) £5 8 0 (enamel)	£1 5 9 (chromium) £1 3 8 (enamel)
BULPITT & SONS, LTD. St. Georges Works, Icknield Street, Birmingham, 18.	"Mayfair" 480 S	1¾ pint	400 W	"Swan-cromalin" plated	Black moulded plastic	Automatic re-set safety device	£5 5 0	£1 3 0
	"Dorchester" 450 S	2 pint	400 W	Polished aluminium	Black moulded plastic	Automatic re-set safety device	£3 12 7	£0 15 11
"CONA" COFFEE MACHINE CO., Felden Works, Railway Place, Wimbledon, S.W.19.	"De-Luxe" Table Model, I, II, IIA and III	½ to 2 pint	350 W	Chromium plated zinc stand, glass bowls	Wooden	Accessories include funnels and drainers	£4 11 9 to £5 9 9	£0 19 3 to £1 3 1
	"Rex"	1½ pint	350 W	Cast aluminium stand, glass bowls	Incorporated in body	On-off switch. Obtainable in range of enamelled colours	£8 19 9	£1 17 9
A. D. DAVIDSON ELECTRIC CO., 62-66, Granville Street, Birmingham, 1.	"Davey" C.601	1½ pint	400 W	Chromium on copper	Bakelite	Urn type fitted with tap	£4 14 6	£1 0 9
	"Davey" C.603	2½ pint	500 W	Chromium on copper	Bakelite	Urn type fitted with tap	£5 15 6	£1 5 4
	"Davey" C.606	4½ pint	950 W	Chromium on copper	Bakelite	Urn type fitted with tap	£8 7 6	£1 16 9
	"Davey" C.618	1½ pint	400 W	Chromium on copper	Bakelite	Jug type	£5 2 11	£1 2 7
ELGA PRODUCTS, LTD., Railway Place, Wimbledon, S.W.19.	"Regency" A.35	1½ pint	450 W	Staffordshire pottery	As body	Automatic action. Matching coffee service extra	£5 10 0 £3 3 0 (coffee service)	£1 4 1 £0 13 10 (coffee service)
	"Stardust" A.36	1½ pint	450 W	Staffordshire pottery	As body	Automatic action. Matching coffee service extra	£5 5 0 £2 2 0 (coffee service)	£1 3 0 £0 9 3 (coffee service)

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	D.5372	1½ pint	400 W	Chromium on copper	Black Bakelite	Automatic re-set safety device	£6 10 0	£1 8 6
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, W.C.2.	Hotpoint 614 PI	8 cups	400 W	Chromium plated copper	Black moulded plastic	Safety cut-out, glass top	£6 17 9	£1 10 3
	Premier 652	8 cups	400 W	Chromium plated copper	Bakelite	Safety cut-out, glass top	£6 17 9	£1 10 3
LINCASS ELECTRIC, LTD., Guildford Street, Chertsey, Surrey.	651	1½ pint	500 W	Chromium plated, black anodised	Black Bakelite	Earthed connector	£4 4 0	£0 18 4
	654	1½ pint	500 W	Chromium plated, black anodised	Black Bakelite	Switched connector	£4 7 6	£0 19 0
RUSSELL HOBBS, LTD., 1, Bensham Lane, Croydon, Surrey.	"Russell Hobbs"	1 to 2 pint	600 W	Ceramic, primrose, dove grey and green, and contemporary flower decorations. Also "Empire" finish	Ceramic	Time control selector. Companion sugar basin and jug extra	£4 4 0 (a.c.) £4 7 6 (a.c./d.c.) £0 11 8 (matching set)	£0 18 5 (a.c.) £0 19 3 (a.c./d.c.) £0 2 6 (matching set)
S.L.R. ELECTRIC, LTD., Welbeck Road, South Harrow, Middlesex.	"Phœnix" CB.6	1½ pint	500 W	Heat-resisting glass	Black Bakelite	Can be used independently on electric hot-plates	£2 12 6	£0 5 7½
F. J. TOMLINSON, LTD., Hall Carr Mill, Rawtenstall, Rossendale, Lancs.	"Handy"	2 pint	450 W	Chromium on copper	Veneered wood	Glass top	£4 4 0	£0 18 11

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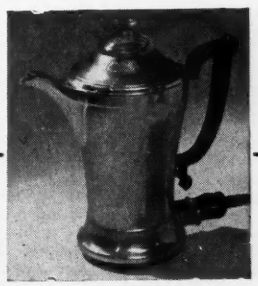

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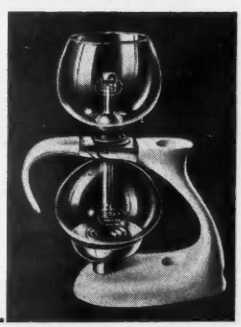

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26. *Elga Products "Autoperc" coffee maker*
27. *Bulpitt "Mayfair" percolator*
28. *Hotpoint 614PI percolator*
29. *Best Products "Best" No. 2 percolator*
30. *A. D. Davidson "Davey" C.601 urn-type percolator*
31. *Russell Hobbs coffee pot*
32. *G.E.C. D.5372 coffee percolator*
33. *Hotpoint "Premier" 652*
34. *S.L.R. "Phœnix" CB.6*
35. *Lincass model 651 percolator*
36. *"Cona" Coffee Machine Co.'s "Rex"*
37. *F. J. Tomlinson's "Handy" percolator*

Financial Section

STOCKS and SHARES

STOCK Exchange markets have failed to find any fresh impetus to replace the interest aroused earlier in the year by the cut in Bank Rate. Business has been quiet, and in the gilt-edged market prices have receded a little further. Industrials have held their ground better. Company news in the shape of dividend and profit announcements has been generally mixed, but in the electrical and atomic power sections mainly good. Results such as those published during the past month or so by English Electric, International Combustion, Desoutter Brothers and Westinghouse Brake have done much to maintain the popularity of shares with electrical associations. More announcements of importance can be expected during the coming month.

English Electric Capital

With the English Electric Company's excellent figures for 1956 already known from the preliminary profits statement, interest in the full report, now issued, looked firstly at the balance-sheet position and for signs of the capital issue which has for some time been expected to be announced. In the accounts the group overdraft is shown to have grown to £16¼ million, and the company's statement refers to the prospect of an issue sooner rather than later. Plans have not yet, however, gone as far as an application for permission from the Capital Issues Committee, so that no immediate operation is to be expected. Other points in the report to receive attention were the increase of 5½ per cent in turnover which, set against the 2½ per cent rise in the trading profit (before tax) indicated narrower margins of profit; and the statement that outstanding orders are a good deal higher than the figure of £163 million reported a year ago.

March Dividends

Of the companies due to declare this month their final dividends and a preliminary statement of the 1956 profits, Associated Electrical Industries are expected to make their announcements at any time now. Brush group results were also last year among the earliest, and news will be due shortly from Ericsson Telephones and Switchgear & Cowans. In the latter case the final payment will apply to capital increased by the issue of 200,000 new shares for cash last October, when the company forecast the maintenance of the previous rate of 15 per cent. A single annual payment is due to be declared by Clarke Chapman, whose shares have risen since this time last year from well under £5 to £7.

Higher Prices

Price changes in the electrical lists over the past week included some good features. C. A. Parsons added 4s 3d to the previous week's gain of 3s 3d, reaching 63s 9d, while Reyrolles climbed further to 105s. G.E.C. came up into line with English Electric at 56s 3d. In the cable and telephone group, British Insulated Callender's

Price Changes in

Company or Board	Nom. Value	Middle price 25th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1956 Highest	1956 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	78½	—1	3	3	3 16 6	80⅛	72½
Brit. Elec. 1974/77	100	75⅛	—1	3	3	3 19 6	79⅛	71½
Brit. Elec. 1976/79	100	80½	—1	3½	3½	4 7 0	84	74½
Brit. Elec. 1974/79	100	90½		4½	4½	4 14 0	95	85½
Overseas Electric Supply								
Calcutta Elec.	£1	18/6		6†	6†	6 9 9†	20/9	18/6
East African Power	£1	20/6		7	7	6 16 6	21/3	19/-
Nigerian Elec.	£1	17/6		10	10*	11 8 6	21/-	17/-
Perak Hydro-Elec.	£1	14/3		10	10*	14 0 9	17/6	14/-
Equipment and Manufacturing								
Aberdare Cables	5/-	11/-	+6d	17½	17½	7 19 0	13/6	9/9
Aerialite	1/-	5/9		45	48	8 7 0	6/9	4/9
Allen, W. H.	£1	38/3		20	10*	5 4 6	39/-	33/6
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	56/-	52/6
Assd. Automation	10/-	20/3		10	5	2 9 6	19/-	15/-
Assoc. Elec. Ord.	£1	66/3		14	15	4 10 6	85/6	57/6
Automatic Tel. & El.	£1	60/-	+2/6	15	15	5 0 0	72/6	50/-
Babcock & Wilcox	£1	81/3	+1/3	15	15	3 13 9	85/6	64/-
Baldwin, H. J.	2/-	4/6		20	20	8 17 9	5/-	3/9
Bakelite	10/-	21/3		16	16	7 10 6	34/-	21/3
Berry's Electric	5/-	5/9		—	10‡	8 14 0	6/6	5/9
British Aluminium	£1	65/-		12	12	3 13 9	78/9	40/6
B.I. Callender's	£1	50/3	+1/-	10	12½	4 19 6	54/3	45/-
B.I. Callender's 6% Pref.	£1	21/9		6	6	5 10 3	22/6	20/3
British Tabulating	£1	47/-		9	9	3 16 6	51/3	37/3
British Thermostat	5/-	26/3		20	25	4 15 3	31/9	24/6
British Vac. Cleaner	5/-	6/6		30	15*	11 11 9	8/9	6/-
Brook Motors	10/-	32/6		25	25	7 13 9	44/-	30/-
Brush Group	5/-	6/-		10	10	8 6 9	7/9	4/6
Bulgin, A. F.	1/-	5/-		45	50	—	5/3	4/-
Burco Dean	5/-	10/6	+3d	22½	20	9 10 6	13/6	8/3
Chloride El. Storage "A"	£1	67/6	+9d	17½	17½	5 3 9	73/6	55/-
Clarke Chapman	£1	140/-	+5/-	20	22½	3 4 3	127/6	89/6
Cole, E. K.	5/-	19/3	+9d	17½	17½	4 11 0	22/3	15/-
Cossor, A. C.	5/-	6/6		15	Nil	Nil	10/3	5/-
Crabtree	10/-	25/-		20	20	8 0 0	29/3	23/-
Crompton Parkinson Ord.	5/-	16/3		16	16	4 18 6	15/-	12/3
De La Rue	5/-	18/6	+3d	30	30	8 2 3	20/3	15/-
Decca "A"	4/-	27/-xr	—3/6	43½	43½	6 9 9	44/9	23/3
Desoutter	5/-	29/6	+1/6	30	32½	5 10 3	32/9	25/9
Dewhurst	2/-	7/-		30	16½*	4 12 9	7/6	5/3
Dictograph Tel.	2/-	7/6	+3d	20	20	5 6 9	7/3	5/6
Dubilier Condenser	1/-	5/6		25	30	5 9 0	5/9	3/6
Duport	5/-	19/-		23	25	6 11 6	21/6	13/9
E.M.I.	10/-	27/-	—3d	15	15	5 11 0	37/-	22/6
Electrical Components	5/-	7/3		25	25	8 12 6*	8/-	6/3
Elec. Construction	£1	25/-		8½	8½	6 16 0	29/9	22/6
Elliott Bros.	5/-	28/9	+1/3	17½	20‡	3 9 6	36/9	22/6
Enfield Cable Ord.	£1	16/3	—1/3	Nil	Nil	Nil	19/3	13/-
English Electric	£1	56/3		12½	14	4 19 6	66/3	43/9
English Electric 3¾% Pref.	£1	13/6		3¾	3¾	5 11 0	14/6	12/6
Ericsson Tel.	5/-	40/-	+2/-	20†	20†	2 10 0	42/9	31/-
Ever Ready	5/-	30/6		35	35	5 14 9	32/9	24/-
Falk Stadelmann	£1	38/3		17½	17½	9 3 0	45/9	35/6
G.E.C. Ord.	£1	56/3	+1/3	12½	14	4 19 6	65/6	41/3
G.E.C. 6½% Pref.	£1	23/-		6½	6½	5 13 0	23/9	21/3
General Cables	5/-	12/9		30	30	11 15 3	13/9	11/3
Greenwood & Batley	£1	46/3		17½	17½	7 11 3	47/6	45/-
Hackbridge Holdings	5/-	19/9		25	30	7 12 0	24/6	18/9
Hackbridge & Hewittic	5/-	15/-		30	23*	7 13 3	22/-	13/9
Heatrae	2/-	4/-		15	15	7 10 0	5/1	3/9
Henley's	10/-	16/6	+3d	10½	11½	6 19 6	19/9	14/-
Holophane	5/-	23/9		30	30	6 6 3	21/6	17/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Cables, London Electric Wire and Telegraph Construction were all 1s or more to the good; Automatic Telephone rose 2s 6d to 60s, and Ericssons, with the final dividend declaration not far away, went 2s higher to 40s. Among radio shares, Pye "A" moved up well to 18s. Telegraph Condenser and Elliott Brothers improved by 1s 3d apiece.

Decca Results

The new 4s "A" shares issued by Decca Record, simultaneously with the results for the year ended last March, have been changing hands at a premium of about 4s 6d on the price of 22s 6d at which they are offered to shareholders of the company. The old "A" shares have been quoted at 27s ex the rights to the issue; these were worth about 1s 6d per share at the price of 32s ruling previously. Results of the group for 1955–56 showed, according to the preliminary statement, an increase in the group's turnover from about £9·5 to £12·9 million. From this, the improvement in the trading profit was limited to £50,000 at £1·8 million, while the net surplus, after larger depreciation and maintenance provisions, came out below the previous year's figure at £430,000. The statement referred to the effects of increased costs for wages and materials, and to heavy expenditure on research and development during the year.

Electrical Investments

Company or Board	Nom. Value	Middle price 25th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1956 High-est	1956 Low-est
Equipment and Manufacturing—continued								
Hoover	5/-	27/9	—6d	70	50	9 0 3	39/3	23/-
I.C.I.	£1	41/-	—3d	10	10	4 17 6	49/9	37/3
Intl. Combustion	5/-	23/9	+1/-	20	22½	4 14 9	25/-	15/3
Johnson & Phillips	£1	30/9	—6d	15	15	9 15 0	46/6	27/6
Lancashire Dynamo	£1	43/9		15	11*	5 0 6	49/9	37/6
Laurence, Scott	5/-	16/9		12½	15	4 9 6	16/9	13/3
Lister, R. A.	£1	30/-		9·3	10	6 13 3	35/3	24/6
London Elec. Wire	£1	49/6	+1/6	12½	12½	5 1 0	52/9	42/6
Lucas, J.	£1	32/6		7½	7½	4 12 3	40/3	28/9
Marryat & Scott	2/-	8/3		30	30	7 5 6	11/3	8/9
Mather & Platt	£1	54/-		15	15	5 11 0	65/3	50/-
Metal Industries	£1	23/9		9	9	—	27/-	16/3
Midland Elec. Mfg.	£1	46/3		10	12½	5 8 0	48/6	43/6
Morphy-Richards	4/-	11/9		50	50	—	13/9	10/-
Murex	£1	70/-		20	20	5 14 3	74/6	60/-
Newman Ind.	2/-	2/3	—3d	10	10	8 17 9	2/9	2/1
Oldham & Son	1/-	2/6		20	17½*	7 0 0	3/-	2/3
Parnall (Yate)	5/-	8/-	+6d	14	12	7 10 0	9/6	5/6
Parsons, C. A.	£1	63/9	+4/3	10	10	—	—	—
Plessey	10/-	69/6	+6d	27½	30	4 6 3	87/6	56/-
Pye "A" Deferred	5/-	18/-	+1/9	12½	12½	3 9 6	21/3	13/3
Reyrolle	£1	105/-	+5/-	15	16½	3 2 0	117/6	81/-
Rheostatic	4/-	10/-		18½	12‡	4 16 0	—	8/3
Richardsons Westgarth	5/-	18/-		16⅝	16⅝	4 12 6	17/3	13/9
Scottish Cables	4/-	18/9		27½	27½	5 17 3	17/9	14/9
Smith (England), S.	4/-	14/3	+6d	17½	17½	4 18 3	14/3	10/6
Southern Areas	£1	17/6		10	7½	8 11 6	28/9	13/9
Strand Elec.	5/-	7/9		15	15	9 13 6	8/6	6/9
Sturtevant	5/-	25/-		14·4†	15†	3 0 0†	31/3	21/3
Sun Elec.	£1	43/9		20	25	11 8 6	42/6	33/9
Switchgear & Cowans	5/-	15/3		20	25	8 4 0	17/-	12/9
Taylor Tunnicliff	5/-	13/3		15	15	5 13 3	14/-	11/3
T.C.C.	10/-	38/9	+1/3	25	25	6 9 0	45/-	33/9
T.C. & M.	£1	31/-	+1/6	8½	8½	5 9 9	34/-	24/-
Telephone Mfg.	5/-	7/-		10	10*	7 2 9	8/6	6/-
Thorn Elec.	5/-	18/9		15	15	4 0 0	22/6	15/-
Thornycroft	£1	33/3		15	12½	7 10 6	49/9	33/6
Tube Investments	£1	58/9	+9d	22½	15*‡	5 2 3	70/6	50/9
Vactric	5/-	15/-		15	17½*	5 16 9	15/-	11/-
Veritys	5/-	9/3		12½	12½	6 15 3	10/-	6/9
Walsall Conduits	4/-	13/-	+9d	70	20*	6 3 0	13/6	10/9
Ward & Goldstone	5/-	41/3	+9d	30	35	4 4 9	39/6	29/-
Watford	2/-	6/6		25	25	7 13 9	7/6	5/6
Westinghouse	£1	80/-		18	18	4 10 0	100/-	67/6
West, Allen	5/-	13/9	—3d	15	15	5 9 0	14/6	11/3
Wolf Electric	5/-	17/6		20	20	5 14 3	26/3	17/6
Trusts, Transport and Communications								
Anglo-Portuguese	£1	23/3		8	8	6 17 9	23/6	20/3
Brit. Elec. Traction: Def. Ord. "A"	5/-	20/-		22½	22½	5 12 6	20/-	15/6
Cable & Wireless: Ord.	5/-	11/3		10	10	4 9 0	11/3	9/3
4% Loan	100	91½		4	4	4 7 6	92½	88
Calcutta Trams	£1	25/9		7½†	8½†	6 12 0†	27/6	23/-
Cape Elec. Trams	£1	15/6		8	8	10 6 6	20/3	15/6
Marconi Marine	£1	33/6	+6d	10	10	5 19 6	34/-	31/-
Oriental Tel. Ord.	1/-	77/6	+1/9	16	—	—	90/-	66/3
Telephone Rentals	5/-	11/-		12½	12½	5 13 9	11/9	9/6

Dividend Prospects

Regarding prospects for the current financial year, which will end with March, the Decca statement disclosed that the group's turnover in the first nine months had been as much as 30 per cent greater than in the same period of the previous year. A substantial contribution was credited to the sales of gramophone records. Expansion of business in other sections of the group was also reported in explanation of the need for fresh capital through the issue of the new shares. These will rank for the present year's dividends, which the company expects to total not less than the present rate of 43¾ per cent. On this basis the new "A" shares, at an all-in price of 27s, offer a prospective yield of just on 6½ per cent. A first interim payment of 6¼ per cent has been declared.

Desoutter Dividend

Desoutter Brothers' 5s shares have appreciated by 1s 6d to 29s 6d since the declaration of the final dividend for 1956, which brings the total for the year to 32½ per cent. This represents an improvement of 2½ per cent on last year's, and the fourth increase in the distribution since the shares came to the market at an issue price of 10s 6d in 1951. Net profits for the latest year show a minor reduction, caused largely by a bigger tax liability. The conservative character of the dividend policy is however maintained since, according to the preliminary figures, the payments on the £350,000 ordinary stock take only £65,400 net from the distributable surplus of £258,000, leaving another large addition to be made to the already substantial reserves.

ASLIB Conference

A conference on business records will be held by ASLIB on 27th March at the Connaught Rooms, Great Queen Street, London, W.C.2. Particulars can be obtained from the Director, ASLIB, 4, Palace Gate, London, W.8.

REPORTS and DIVIDENDS

The General Cable Manufacturing Co., Ltd.—The annual meeting was held on 21st February, Mr. C. W. R. Pantlin (chairman) presiding. In the course of his remarks Mr. Pantlin said that from a peak of £437 per ton, the price of copper plunged down to £290 in a matter of two months, taking with it rubber cable selling prices. In consequence, the value of cable stocks and work in progress suffered a heavy loss through having to be written down and this had a considerable impact on the trading profit. Accordingly, although the turnover of rubber and plastic cables for the year was satisfactorily maintained, the profit arising from that section of the business was relatively disappointing. With regard to paper insulated power cables, despite increased requirements of working capital created by the high copper price, and restriction of demands from the electricity supply industry as a result of the "credit squeeze," the subsidiary, Britannic Cables, Ltd., achieved a satisfactory result.

Marco Refrigerators, Ltd.—In his circulated statement covering the past year, Mr. E. G. Batt (chairman) said that the turnover increased in both the home and overseas markets. Two new ranges of frozen food display cabinets were introduced during the year, both of which were selling in satisfactory quantities.

The Gas Purification & Chemical Co., Ltd., announces that it has contracted to acquire the ordinary share capital of A.B. Metal Products, Ltd., of Abercynon, Glamorgan, in consideration of the issue of 263,000 shares of 5s each. Before the acquisition A.B. Metal Products, Ltd., issued as a bonus to its existing shareholders 50,000 7½ per cent cumulative preference shares of £1 each. A.B. Metal Products manufactures a wide range of specialised components including potentiometers, mains resistors, rotary and lever switches, push-button and piano action switches and specialised electronic and mechanical assemblies. Mr. A. Marks, who will continue as managing director of A.B. Metal Products, has been co-opted to the board of the Gas Purification & Chemical Co.

The British Oxygen Co., Ltd.—The group profits for the year to 30th September last amounted to £5,198,464, as compared with £4,277,152 for 1954-55. The figure for the latter year included the parent company's trading for nine months only. After providing for taxation the balance available to the parent company is £2,260,906 (against £1,764,673). It is proposed to pay a final dividend of 6 per cent, making 10 per cent for the year on £17,047,166 ordinary stock increased by a 50 per cent scrip issue. For the previous year an interim dividend of 6 per cent was paid on £8,117,698 and was followed by a final payment of 9 per cent on £11,364,777.

Hilger & Watts, Ltd.—The group profit for the year to 30th September last is £123,479, as compared with £124,193 for 1954-55. Taxation requires £71,897, and the net profit is £51,582 (against £55,049), of which £47,897 is dealt with in the accounts of the parent company. It is proposed to pay a final ordinary dividend of 7 per cent, on increased capital, making, with the 3 per cent interim dividend on the smaller capital, 10 per cent for the year (unchanged). The balance carried forward is £151,150 (against £127,925 brought in).

Telephone Rentals, Ltd. — The directors announce that the result of the rights issue of 1,408,000 5s ordinary shares at 7s 6d per share was as follows: — 1,348,100 shares were accepted on provisional allotment letters representing 95·75 per cent of the total available and 1,984 excess applications were received for a total of 912,715 shares. Applications for excess shares had to be drastically scaled down.

Desoutter Brothers (Holdings), Ltd. —The group net profit for 1956 is £269,054, as compared with £279,788 for 1955. United Kingdom taxation absorbed £281,516. General reserve receives £150,000 and it is proposed to pay a final dividend of 20 per cent (against 17½ per cent), making 32½ per cent for the year (30 per cent). The balance carried forward is £175,422 (against £147,111 brought in).

The Electrical & Industrial Investment Co., Ltd., reports that after providing £67,300 for taxation, the net profit for 1956 is £85,084, as compared with £71,636 for the preceding year. The deferred ordinary dividend for the year is maintained at 80 per cent, leaving £31,609 to be added to undivided profits.

Parmiter, Hope & Sugden, Ltd., have announced an interim dividend of 7½ per cent (unchanged).

The Midland Electric Manufacturing Co., Ltd.—The group net profit, after taxation, including subsidiaries for 15 months, is £248,965 (parent company only last year, £231,465). Taxation absorbed £240,500. The ordinary dividend for the year is unchanged at 12½ per cent.

International Combustion Africa, Ltd., is paying a final dividend of 25 per cent, making 40 per cent for the year (unchanged).

Solus Teoranta, the Irish lamp manufacturing concern, is paying an interim dividend of 5 per cent (unchanged).

Keith Blackman, Ltd.—Following the acquisition of a controlling interest in the Blackman Export Co., Ltd., the latter company has become a wholly owned subsidiary of Keith Blackman, Ltd.

Unidare, Ltd. (formerly Aberdare Electric Co., Ltd.).—The lists opened on Wednesday and were to close on or before the following day for an issue of one million ordinary shares of 5s each at 6s 8d per share. The establishment of a new factory by the company at Finglas, Co. Dublin, and an agreement with Reynolds International, Inc., of the United States, are referred to on page 392.

The Calcutta Tramways Co., Ltd., has declared an interim dividend of 3½ per cent, tax free (unchanged).

Liquidations

Calvert & Heald, Ltd., radio and electrical engineers and dealers.—Winding up voluntarily. Liquidator, Mr. L. H. Shipton of Poppleton & Appleby, 31, Lloyd Street, Manchester, 2, appointed 7th February.

Southdown Television Services, Ltd., radio and television dealers.—Winding up. Liquidator, Mr. A. W. Hunter, of Latham & Co., Walter House, 418-422, Strand, London, W.C.2, appointed 1st February.

Bow Electromek, Ltd., electrical and mechanical engineers.—Winding up voluntarily. Liquidator, Mr. C. Guy Gordon, 245-249, Whitechapel Road, London, E.1, appointed 31st January.

Cornelius Electronic Instruments, Ltd. (in voluntary liquidation).—Meeting of members 18th March at 1, Lansdowne Place, Warwick Road, Coventry, to receive an account of the winding-up by the liquidator, Mr. W. Tooth.

Electro Insulators, Ltd. (in voluntary liquidation).—Meeting of members 15th March at Benefit Buildings, Moorhead, Sheffield, 1, to receive an account of the winding-up by the liquidator, Mr. L. Ettling.

Attracta Electrical & Engineering Co., Ltd. —Last day for receiving proofs for dividend 2nd March. Liquidator, Mr. F. M. Collins, Senior Official Receiver and Liquidator, Inveresk House, 346, Strand, London, W.C.2.

Fife Radio & Television, Ltd., radio and television manufacturers.—Liquidator, Mr. F. M. Collins, Senior Official Receiver and Liquidator, released 6th February.

Bankruptcies

J. V. Little, plumber and electrician, Braeside, Allendale, near Hexham, Northumberland, lately residing and carrying on business at 25, Park Road, Haltwhistle, Northumberland.—Trustee, Mr. D. Atkinson, 14, Lowther Street, Carlisle, Official Receiver, released 7th February.

T. R. Hugo, trading as "Victor Hugo's" at 51, Fawcett Road, Southsea, as a radio and electrical engineer.—Trustee, Mr. W. H. Meredith, 16, Westwood Road, Southampton, Official Receiver, released 13th February.

R. Powell, 28, Sedbergh Crescent, Newbold, Chesterfield, lately carrying on business as an electrical goods retailer under the style of Domestic Electrics at 127, Newgate Lane, Mansfield, Notts, salesman.—Last day for receiving proofs for dividend 6th March. Trustee, Mr. K. A. Miller, 55, Queen Street, Sheffield, 1, Official Receiver.

G. H. Evans, radio, electrical and television engineer, High Street, Mayfield, Sussex, trading as G. H. Evans & Co.—Last day for receiving proofs for dividend 5th March. Trustee, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton, 1.

J. R. Short, c/o 23, Primrose Street, South Hylton, near Sunderland, formerly carrying on business at 11, Rutland Avenue, Bishop Auckland, electrical contractor.—Supplemental dividend of 2⅜d in the £, payable at the Official Receiver's office, Clarendon House, Clayton Street West, Newcastle-upon-Tyne, 1.

GENERATION AND DEVELOPMENT

Large Scottish Contracts

Two contracts, worth together £3,750,000, have recently been awarded to the Mitchell Construction Co. for power schemes in Scotland. The first, valued at £2½ million, is for the construction of over 13 miles of tunnels on the Killin section of the North of Scotland Hydro-Electric Board's Breadalbane scheme in Perthshire. The contract will also include the construction of pipeline aquaduct sections totalling eight miles and the laying of access roads covering many miles. The company will be responsible for the construction of all the associated intake weirs and shafts. Two camps will be built and maintained by the company for the labour force, which will total up to 600 men during the peak construction period. The contract will cover three years. The consulting engineers for the project are Messrs. James Williamson & Partners.

The second contract, worth £1¼ million, has been awarded by the South of Scotland Electricity Board for work on the new generating station at Kincardine, Fife. The company will be responsible for the construction of the superstructure of the main building, the turbine house, boiler house, administration and workshop blocks, and other ancillary buildings.

Work will begin on the site immediately and the station is due for completion in about 3½ years. The consulting engineers for the Kincardine generating station are Messrs. Kennedy & Donkin.

Electricity Sales in January

The accompanying table analyses the sales of the twelve Electricity Boards in England and Wales for the month and year ended 31st January last. The national figures show an increase over January, 1956, of 4·9 per cent, but when corrected for weather and number of working days the increase is 6 per cent.

Supergrid Route Approved

Buckinghamshire County Council has been informed that the Minister of Power has approved the Central Electricity Authority's route for the section of its supergrid in Buckinghamshire through the Wendover Gap at the northern edge of the Chiltern Hills to which objection was taken.

Two routes had been proposed, one by the C.E.A., which took the line through the Wendover Gap, and an alternative route by the local authority which did not.

Y.E.B. Tariff Revision Approved

The Yorkshire Electricity Board, at its meeting last Friday, approved the revised tariffs, details of which were given in our last issue.

Aluminium Cables in Scotland

The *Kelvin*, the magazine of the South of Scotland Electricity Board, says that as a result of successful experiments the Board proposes to use during this year aluminium conductor cables in place of copper cables on some 1,100 V and 11 kV cables. The cost of cables during 1957 is put at over £1 million and it is stated that the use of aluminium will result in a saving of about £160,000.

Domestic Tariff Suggestion

At its meeting at Reading on 19th February the Southern Electricity Consultative Council considered a suggestion put forward by a consumer that a flat rate domestic tariff should be introduced with a possible surcharge for over-average consumers. The Council was of the opinion that though this might benefit those who used little electricity it would adversely affect the majority of consumers and decided to make no recommendation to the Board.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for January (million kWh)			Twelve Months' Totals Ended 31st January (million kWh)		
	1956	1957	Inc. or Dec. %	1956	1957	Inc. or Dec. %
London	762·8	774·0	+1·5	6,563·0	7,063·9	+ 7·6
South Eastern	452·2	473·9	+4·8	4,041·1	4,530·5	+12·1
Southern	544·7	586·9	+7·7	4,872·9	5,493·1	+12·7
South Western	266·8	284·3	+6·6	2,503·1	2,783·4	+11·2
Eastern	725·6	757·5	+4·4	6,482·7	7,199·8	+11·1
East Midlands*	599·7	625·3	+4·3	5,649·1	6,104·2	+ 8·1
Midlands*	790·0	816·8	+3·4	7,435·5	7,833·7	+ 5·4
South Wales*	415·4	446·6	+7·5	4,330·0	4,549·2	+ 5·1
Merseyside and N. Wales*	451·8	479·6	+6·2	4,446·4	4,879·3	+ 8·2
Yorkshire*	771·2	813·6	+5·5	7,351·1	7,918·5	+ 7·7
North Eastern*	426·3	448·9	+5·3	4,229·4	4,556·6	+ 7·7
North Western*	811·2	844·6	+4·1	7,874·4	8,310·7	+ 5·5
Total all Area Boards	7,017·7	7,352·0	+4·8	65,778·7	71,152·9	+ 8·2
Direct Supplies by Central Authority	184·1	201·9	+9·7	1,895·2	2,182·5	+15·1
Grand Total	7,201·8	7,553·9	+4·9	67,673·9	73,335·4	+ 8·4
Mainly Industrial Areas*	4,265·6	4,475·4	+4·9	41,315·9	44,082·2	+ 6·7
Mainly Non-Industrial Areas	2,752·1	2,876·6	+4·5	24,462·8	27,070·7	+10·7

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

OVERSEAS

East African Power Schemes

Before leaving Nairobi by air for London recently after a tour of East Africa, Sir Andrew MacTaggart, chairman of the London board of the East African Power & Lighting Co., Ltd., and the Power Securities Corporation, Ltd., spoke of schemes for developing power supplies in Tanganyika and Kenya. Referring to a resolution by the Legislative Council of Tanganyika approving the advancing of a sum not exceeding £2,000,000 to the Tanganyika Electric Supply Co., Ltd., he said the money was required for the construction of a transmission line from the Hale or the Pangani power station to Dar-es-Salaam and Morogoro. The fact that the Government had agreed to advance this money was "something new" and he considered it a very important step in the right direction. The sole purpose was to make power available at the least cost possible in areas where development would be attracted. The advances by the Government would be free of interest for a period of five years from the date of the first advance and would then be convertible into ordinary shares of the company issued at par, or would be repaid at the option of the Government.

On development in Kenya, Sir Andrew said that the Tana River held the real answer to further power and security of supply. While the building of the power line from Tororo to Nairobi—a distance of 253 miles—to obtain a supply from Uganda was the best answer at the time they entered into an agreement for a supply from that source, it was not the answer to the future power requirements of Kenya. In the case of the Tana River, and the Seven Forks scheme which had Government approval, Kenya had at this point a project capable of producing 100 MW. By making use of the tail waters and continuing the development of falls between the tail-race of the Seven Forks scheme and the outlet of the river, there was a further power potential amounting to more than 100 MW, he said. This was one of the territory's greatest and most secure power sources with a guarantee that, once developed, fuel cost would be capitalised. Though thermal backing would be to a certain extent necessary, this might well take the form of nuclear power and so overcome the difficulties of oil supply.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 4th March

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "The Post Office Telephone Network," by A. Ness; "Electricity in Ships," by J. E. Herrin; and "The Use of Aluminium for Busbars," by A. Davies. (Joint meeting with the Graduate & Student Section.)

CHATHAM. — Medway College of Technology, Maidstone Road, 6.30 for 7 p.m. I.E.E. district meeting. "A Description of a Medium Sized Electrical Distribution System with particular reference to Efforts made to reduce Energy Costs," by R. W. Robinson.

CHELTENHAM. — The Rotunda, 7.30 p.m. Society of Instrument Technology, Cheltenham Section. "Ultrasonics," by O. Roberts.

IPSWICH.—Crown & Anchor Hotel, 6 for 6.30 p.m. I.E.E. East Anglian Sub-Centre. "Choice of Insulation and Surge Protection of Overhead Transmission Lines of 33 kV and Above," by A. Morris Thomas and D. F. Oakeshott.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "R.F. Heating and its Application in Industry," by J. Pound.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "Electronics and Automation, Some Industrial Application," by Dr. H. A. Thomas.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio & Telecommunication Section. Informal evening on "Electronics in Administration—A Survey," talk by Dr. D. C. Espley.

White Hall Hotel, Bloomsbury Square, W.C.1, 7.30 p.m. A.S.E.E. Central London Branch. "Cathode Ray Tubes and T.V.," by C. H. Gardner.

John Adam Street, Adelphi, 6 p.m. Royal Society of Arts. Cantor Lecture, "Modern Lighting," by D. W. Durrant, C. Dykes Brown and J. M. Waldram.

Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Various Aspects of Power Transformer Design," by L. Smith.

NEWCASTLE-UPON-TYNE. — King's College, 6.15 p.m. I.E.E. North-Eastern Radio & Measurements Group. "An Experimental Study of High-Permeability Nickel-Iron Alloys," by C. E. Richards, E. V. Walker and A. C. Lynch.

County Hotel, Neville Street, 6 for 6.30 p.m. North East Electrical Club. "Lamp and Lighting Research," by H. R. Ruff and R. V. Mills.

REDRUTH.—Technical College, Trevenson, Pool, 7 p.m. Institution of Production Engineers, South Western Region. "Automation." (Joint meeting with the Institution of Mechanical Engineers.)

Tuesday, 5th March

BARNSLEY.—Town Hall, 7 p.m. I.E.E. North Midland Centre. "Mine Locomotives," by T. E. Green. (Joint meeting with the Sheffield Sub-Centre.)

BELFAST.—Queen's University, 7.30 p.m. I.E.E. Northern Ireland Centre. Faraday Lecture, "Nuclear Energy in the Service of Man," by Dr. T. E. Allibone.

BRADFORD.—Y.E.B., Sunbridge Road, 7 p.m. I.E.E. North Midland Graduate & Student Section. "Project Considerations for Diesel Electric Traction," by R. S. Wignall.

CAMBRIDGE.—Cavendish Laboratory, 8 p.m. I.E.E. East Anglian Sub-Centre. "Cathodic Protection," by L. B. Hobgen, K. A. Spencer and P. W. Heselgrave.

DERBY.—E.M.E.B. Service Centre, 6.30 p.m. I.E.E. East Midland Centre. "Electrolytic Processes for Surface Conditioning of Metals," by Prof. J. W. Cuthbertson.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "The Measurement of Earth-Loop Resistance," by Dr. G. F. Tagg.

HAMMERSMITH. — Windsor Castle Hotel, 134, King Street, 7 p.m. A.S.E.E. West London Branch. "Trinity House, Signalling and Lighting," by K. H. Gillanders.

ILFORD.—Angel Hotel, 7.30 p.m. A.S.E.E. North East London Branch. "The Balu Chaung Hydro-Electric Scheme," by J. A. Hill.

LONDON.—The Criterion, 7 for 7.30 p.m. I.E.E. Supply Section. Dinner-dance.

At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "Work Study—its Purpose and Application," by R. A. Cooper.

21, Bloomsbury Street, W.C.1, 5.45 for 6.15 p.m. Association of Mining Electrical & Mechanical Engineers, London Branch. "Generation of Electricity by the Utilisation of Methane Gas," by R. Shillington.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "D.c. Winder Drives using Mercury Arc Rectifier/Inverters," by L. Abram, J. B. McBreen and J. Sherlock.

NEWCASTLE-UPON-TYNE. — Crown Hotel, 7.30 p.m. A.S.E.E. Tyneside Branch. "Industrial Uses of Magnetic Power," by T. G. Hawker.

READING.—The University, London Road, 7.15 p.m. A.S.E.E. Oxford, Reading & Districts Branch. "The Uses of Electronic Valves," by C. H. Gardner.

Tuesday, 5th March, to Saturday, 30th March

LONDON.—Olympia. Ideal Home Exhibition.

Wednesday, 6th March

ABERDEEN.—Marischal College, 7.15 p.m. Institute of Physics, Scottish Branch. "Research in Nuclear Physics at the University of Glasgow," by Prof. P. I. Dee.

BIRMINGHAM.—James Watt Institute, Great Charles Street, 7 p.m. Junior Institution of Engineers, Midland Section. Re-delivery of presidential address, "Fuel Economy and Heat-Electric Generation," by B. Donkin.

EDINBURGH. — Y.M.C.A., 14, South St. Andrew Street, 6.15 p.m. I.E.S. Edinburgh Centre. "Lighting and Production," by J. W. Howell.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "The Measurement of Earth-Loop Resistance," by Dr. G. F. Tagg.

39, Elmbank Crescent, 8 p.m. A.S.E.E. Glasgow Branch. "Safety in the Factory," by J. W. Jones.

LIVERPOOL.—1, Old Hall Street, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "The Preparation of Service and Technical Data Sheets," by E. A. W. Spreadbury.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate & Student Section. Film evening.

MANCHESTER. — Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Shop and Store Lighting." (Joint meeting with the Illuminating Engineering Society.)

MIDDLESBROUGH.—Cleveland Scientific & Technical Institute, Corporation Road, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Atomic Power Stations," by D. F. Welch.

NOTTINGHAM. — Victoria Station Hotel, 7 p.m. I.E.E. East Midland Centre. Annual dinner.

College of Arts & Crafts, Waverley Street, 6.45 p.m. Institution of Heating & Ventilating Engineers, East Midland Branch. "Warm Air Heating and Ventilating," by G. L. Simpson.

PORTSMOUTH.—C.E.A., 111, High Street, 6.30 p.m. I.E.E. Southern Centre. "Germanium and Silicon Power Rectifiers," by T. H. Kinman, G. A. Carrick, R. G. Hibberd and A. J. Blundell.

PRESTON.—R.A.F.A. Club, East View, 7.30 p.m. A.S.E.E. Preston Branch. "Thermal Storage Heating," by C. J. Wheeler.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Graduate & Student Section. "The Testing of High-Voltage Power Transformers," by R. E. James.

SWANSEA.—At the South Wales Electricity Board, The Kingsway, 6.30 p.m. I.E.S. Swansea Group. "Lighting for Photography," by R. W. Unwin. (Joint meeting with the Swansea and Mumbles Camera Club.)

WEMBLEY.—I.E.E. London Graduate & Student Section. Visit to Goodmans, Ltd., loudspeaker manufacturers, at 2.30 p.m.

Thursday, 7th March

CARDIFF.—At the South Wales Electricity Board's Demonstration Theatre, The Hayes, 7 p.m. I.E.S. Cardiff Centre. "Lighting for Photography," by R. W. Unwin.

CHELMSFORD. — Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Modern Steam Generating Plant," by E. C. McKenzie.

CROYDON.—Half Moon Hotel, Broad Green, 8 p.m. A.S.E.E. South London Branch. "Factory Installations."

GLASGOW.—39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. Annual general meeting, followed by "Lighting and Production," by J. W. Howell.

HULL.—Electricity Buildings, Ferensway, 6.15 p.m. Joint meeting of the Institutions of Civil and Structural Engineers. "Nuclear Power Station Construction," by W. H. C. Pilling.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers, ordinary meeting. "Cathodic Protection," by L. B. Hobgen, K. A. Spencer and P. W. Heselgrave.

NOTTINGHAM.—Electricity Service Centre, Smithy Row, 5.30 p.m. I.E.S. Nottingham Centre. "Lighting Considered as a Basis for Design," by D. Phillips.

SOUTHAMPTON.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "Earthing and Fault Protection," by H. W. Swann.

Friday, 8th March

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 7 p.m. Society of Instrument Technology, Midland Section. "Instruments in the Aircraft Industry," by J. Scholls.

CHESTER. — A.S.E.E. Liverpool Branch. Evening visit to John Summers & Sons, Ltd., Hawarden Bridge Steelworks, Shotton.

GLASGOW.—Marlborough House, Langside. Institution of Works Managers, Glasgow Branch. Dinner-dance.

LONDON.—Caxton Hall, S.W.1, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Technical Group. "Gadgets night."

21, Albemarle Street, W.1, 9 p.m. Royal Institution of Great Britain. "European Organisation for Nuclear Research," by Sir Ben Lockspeiser.

Grosvenor House, W.1, 6.30 for 7 p.m. Institute of Marine Engineers. Annual dinner.

MANCHESTER.—Grand Hotel, 6.45 p.m. Manchester Association of Engineers. Annual dinner and dance.

NEWCASTLE-UPON-TYNE. — Liberal Club, 7 p.m. I.E.E. North-Eastern Centre. "The Work of the Royal Navy Electrical Branch at Sea," by Cmdr. J. C. Turnbull, R.N., and "Recent Developments in Astronomical Telescopes," by G. M. Sisson.

NOTTINGHAM.—Welbeck Hotel. I.E.S. Nottingham Branch. Annual ladies' evening.

Saturday, 9th March

HEADINGLEY. — I.E.E. North Midland Graduate & Student Section. Visit to Wool Research Association, at 9.30 a.m.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—City of Melbourne. 13th March. L.v. air break circuit-breakers and current transformers. (E.S.B. 4618/57. Ten/24322.)*

Southern Electric Authority of Queensland. 4th April. 3·3 kV auxiliary switchgear. (E.S.B. 4498/57. Ten/24316.)*

General Post Office, Melbourne. 4th April. Telephone meters. (E.S.B. 4192/57. Ten/24256.)*

Electricity Commission of New South Wales. 15th April. Power transformers. (E.S.B. 4161/57. Ten/24231.)*

Brazil.—Comissão Estadual de Energia Eléctrica. 7th May. Five transformer substations. (E.S.B. 3886/57. Ten/24223.)*

Clones (Co. Monaghan).—11th March. Electrical installation in Convent National School. S. McCann, architect, Monaghan.

Flint.—Borough Council. 15th March. Street lighting equipment. Borough engineer, Municipal Offices, Earl Street.

India.—Government of Madras. 25th March. Scientific instruments including voltmeters, ammeters, current transformers, resistances, rheostats, etc. (E.S.B. 4079/57. Ten/24218.)*

Punjab P.W.D., Electricity Branch, Simla. 2nd April. Transformers ranging from 15 kVA to 1,000 kVA. (E.S.B. 4461/57. Ten/24259.)*

Hydel Electricity Department, Uttar Pradesh. 14th May. Two 11,000 kVA generating units, two 15,000 kVA and one 1,500 kVA transformers, power and control cables. (E.S.B. 3946/57. Ten/24225.)*

Iraq.—Directorate General of Municipalities. 13th April. Copper conductor wire. (E.S.B. 4902/57. Ten/24352.)* Copper conductors. (E.S.B. 4903/57. Ten/24348.)*

London.—Stepney Borough Council. 25th March. Electrical installations in 44 dwellings. (See this issue.)

New Zealand.—General Post Office. 22nd March. 340 relay components. (E.S.B. 4515/57. Ten/24315.)* 1st April. Copper stranded wire. (E.S.B. 4797/57. Ten/24361.)*

State Hydro-Electric Department, Wellington. 11th June. 56,664 kVA transformer bank and spare unit. (E.S.B. 4457/57. Ten/24266.)*

Pontypridd.—U.D.C. 16th March. Street lighting equipment. (See this issue.)

Rainhill.—Parish Council. 23rd March. Street lighting equipment. (See this issue.)

Rhodesia and Nyasaland.—Federal Power Board. 7th March. Two electric passenger lifts for Kariba power station. (E.S.B. 4164/57. Ten/24264.)*

Federal Tender Board. 8th March. Short haul six-channel telephone system. (E.S.B. 4483/57. Ten/24318.)* 660 V armoured cable. (E.S.B. 4486/57. Ten/24304.)* 15th March. 25,000 75 W electric lamps. (E.S.B. 4484/57. Ten/24312.)*

City of Salisbury. 2nd April. Switch, fuse and ancillary gear for the year ending 30th June, 1958. (E.S.B. 4489/57. Ten/24333.)* Transformers ranging from 50 kVA to 8,000 kVA for the year ending 30th June, 1958. (E.S.B. 4513/57. Ten/24301.)* 19th March. Cable for the year ended 30th June, 1958. (E.S.B. 4511/57. Ten/24319.)* Cable boxes and accessories. (E.S.B. 4512/57. Ten/24302.)* 26th March. Line materials and conductors. (E.S.B. 4490/57. Ten/24312.)*

South Africa.—Union Tender and Supplies Board. 7th March. Insulated cable. (E.S.B. 4271/57. Ten/24217.)* 1,200,000 steel insulated staples. (E.S.B. 4317/57. Ten/24252.)* 4th April. Telephone switchboards. (E.S.B. 42278/57. Ten/24253.)*

Stores Department, South African Railways. 13th March. Telegraph line material. (E.S.B. 4375/57. Ten/24281.)* 15th March. Signalling cable. (E.S.B. 4173/57. Ten/24207.)* Lead alloy sheathed v.i.r. cable and copper wire. (E.S.B. 4174/57. Ten/24216.)* 20th March. 400 kVA transformer and oil circuit-breaker panel. (E.S.B. 4376/57. Ten/24293.)* 29th March. Track section and isolating switches. (E.S.B. 4381/57. Ten/24291.)* 6·6 kV and 250 V cable. (E.S.B. 4379/57. Ten/24292.)* Telegraph line material. (E.S.B. 4377-8/57. Ten/24283-4.)* Electric motors and control gear for wharf cranes. (E.S.B. 4380/57. Ten/24277.)*

Usk (Mon).—U.D.C. 8th March. Street lighting scheme. Surveyor, Council Offices.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Durham.—County Education Committee. Electrical work in Spennymoor Rosa Street County School (£1,131).—North of England Engineering & Electrical Co. Trimdon New Modern School (£5,769).—T. Mitchelson (Electrical).

London.—Southwark Borough Council. Recommended. 83 Group "A" and 113 Group "B" street lighting units for Stage 1 of the modernisation scheme (£6,779).—Erecon.

Newcastle-on-Tyne.—City Council. Street lighting equipment (£13,196).—Revo Electric Co.

South Shields. — Education Committee. Recommended. Electrical installation work at Mortimer County Secondary School, Brinkburn (£12,754).—A. Robertson.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Amble.—Houses (45), Links estate; W. Charity, U.D.C. surveyor.

Basildon.—Shopping centre, Nevendon area, for Development Corporation; general manager, Gifford House, London Road, Bowes Gifford, Essex.

Birmingham.—Works and offices, Sherlock Street; W. A. Webb & Co., Ltd., 192, Sherlock Street.

Departmental stores in Fairfax Road; Woodbourne, company architect, F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Bodmin.—Showrooms and petrol station, Burnards Lane; Bodmin Motors, Ltd., Town Arms Garage.

Brighton.—Dwellings (200), The Links, North Woodingdean; borough surveyor.

Bristol.—Shops on the Fairfax Street/Merchant Street sites; Ravenseft Properties, Ltd., 52, Charles Street, London, W.1.

Chislehurst & Sidcup.—Houses (121), Chalk Pit estate; W. B. Farrow, U.D.C. surveyor, Manor House, Sidcup, Kent.

Croydon.—Dwellings (44), Elmwood Road; E. Taberner, town clerk, Town Hall.

Cumbernaud. — Houses (98); general manager, Development Corporation, 91, Mitchell Street, Glasgow.

Darlington.—Houses (370), Skerne Park estate; F. Shepherd & Son, Ltd., contractors, York.

R.C. primary school in Harris Street; Dunn & Dunwell, builders, Arden Street.

Doncaster.—Museum and art gallery; borough architect, 15, South Parade.

Eastbourne.—Grammar school, Hampden Park; R. Williams, borough surveyor, 2-4, Saffrons Road.

Edgware.—Flats (30), Purcells Avenue; E. J. T. Neal, surveyor, 39, Station Road.

Exeter. — Students' union building (£310,000), for University authorities; Gardiner & Theobold, quantity surveyors, 49, Bedford Square, London, W.C.1.

Farnborough.—Second phase of scheme for technical college (£143,000); Hants county architect, The Castle, Winchester.

Guisborough.—Houses (386), Hutton Lane estate, for U.D.C.; P. R. Middleton, architect, 17, Albert Road, Middlesbrough.

Halesowen.—Houses (109), Bassnage Farm estate; T. Teisen, builder, Old Meeting House Road, Coseley.

Hove.—Flats (57), Seafront; R. Green (Brighton), Ltd., 5, Pavilion Buildings, Brighton.

Isle of Wight.—Development of Longford Hospital (£203,100); South West Metropolitan Regional Hospital Board, 11, Portland Place, London, W.1.

Isleworth.—Special training school at Bridge Road (£35,000); Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Leicester.—Chemistry building (£370,000) for university authorities; Arup Ove & Partners, consulting engineers, 8, Fitzroy Street, London, W.1.

London.—New offices, Central Garage, The Highway, Stepney, E.14; borough engineer, Municipal Offices, 227-233, Commercial Road, E.1.

Flats and maisonnettes (106), Cassidy Street, Fulham; E. R. Knight, borough surveyor, Town Hall, S.W.6.

Luton.—Development of the Lewsey Farm area for shops, houses, community buildings, etc.; director of housing, Town Hall.

Maidenhead.—Secondary modern school; Howard V. Lobb & Partners, architects, 20, Gower Street, London, W.C.1.

Manchester.—Factory, Chatley Street and Elsworth Street, for P. & H. Bailey; Peter Cummings, architect, 16, Oxford Street, Manchester, 1.

Warehouse and offices, Church Street; Eric Levy, architect, 32, Deansgate.

North Riding.—Proposed Skelton and Brotton County Modern School (£113,000); John Laing & Sons, builders, Dalston Road, Carlisle.

North Shields.—Warehouse and offices, Thrift Street; J. Hogg & Son (North Shields), Ltd., brassfounders and coppersmiths, Collingwood House, Lawson Street.

Houses (20), Beadnell Avenue (£29,469); J. H. Rogers, Regent Terrace.

Northern Ireland.—Three factories at Carnmoney industrial estate and two at Dunmurry industrial estate for the Ministry of Commerce; Munce & Kennedy, architects, 133, University Street, Belfast.

New headquarters at Rosemary Street, Belfast, for the N.S.P.C.A.; Lewis & Baxter, architects, 16, Howard Street, Belfast.

[*Continued on next page*

WORK IN PROSPECT (*continued*)

Northumberland.—New schools at Allendale, Corbridge, Coxlodge, Gosforth and Walbottle; C. C. Brown, county architect, County Hall, Newcastle-on-Tyne.

Orpington.—Ramsden secondary school for girls (£118,000); Kent county architect, Springfield, Maidstone.

Poole.—Extensions at General Hospital (£620,000); South West Metropolitan Regional Hospital Board, 76, Wimpole Street, London, W.1.

Romford. — Grammar/technical school, Lodge Lane (£240,000); H. Conolly, Essex county architect, County Hall, Chelmsford.

St. Albans.—Houses (234), Marshalwick Farm estate; T. F. Nash (Contractors), Ltd., Uxbridge Road, Hayes, Middx.

Smethwick.—Training school and extensions to heat treatment department, Grove Street; Guest, Keen & Nettlefolds, Ltd., Heath Street Works, Birmingham, 18.

Somerset.—Secondary modern schools at Wellington and West Monkton; R. O. Harris, county architect, Park Street, Taunton.

Southampton.—Factory, Millbrook estate; Thomas & Evans, Ltd., Porth, Rhondda.

South Bank-on-Tees.—R.C. primary school at St. Margaret's Grove; T. A. Crawford, architect, 80, Borough Road, Middlesbrough.

Spalding.—New high school; county architect, Boston, Lincs.

Stroud.—Houses (55), Farmhill estate; F. Foster Langley, U.D.C. surveyor, High Street, Stroud, Glos.

Sunderland.—Proposed Castle View County Secondary School (£170,000); Middleton & Co. (Blackpool), Ltd., contractors, Darlington.

Secondary mixed school at Broadway (£157,336); W. & D. Allison, Whitburn, Sunderland.

Swindon.—Secondary modern school, Walcot estate; John Laing & Son, Ltd., builders, Bunns Lane, London, N.W.7.

Tewkesbury.—Dwellings (76), Canterbury Leys; Rainger, Rogers & Smithson, architects, Glenmore Lodge, Wellington Square, Cheltenham.

Thornaby-on-Tees. — Modern school (£123,000); John Laing & Sons, contractors, Dalston Road, Carlisle.

Wallsend.—Multiple stores, High Street/East Road/Station Road site; Woodbourne, company architect, F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Wembley.—Two-storey extensions to works; Crosby Valve & Engineering Co., Ltd., Ealing Road.

Church hall and ancillary buildings, East Lane; A. D. Cooke, architect, 46, Prince of Wales Road, Norwich.

Weston-super-Mare. — Shopping centre, Oldmixon/Coronation housing estates; R. G. Lickfold, town clerk, Town Hall.

Wigton.—Houses (128); R.D.C. surveyor.

Windsor.—Dedworth Secondary Modern School; Cecil C. Handyside, architect, 68, Great Russell Street, London, W.C.1.

Wolverhampton.—Extensions to departmental stores, Victoria Street (£200,000), for James Beattie, Ltd.; Lavender, Twentyman & Percy, architects, Waterloo Chambers, Waterloo Road.

Wood Green.—Warehouse and offices, Bounds Green Road; Dottridge Bros., Ltd., 27, New North Road, London, N.1.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 6th March from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

1545. Western Electric Co., Inc.—Electro-optical systems. 18th January, 1945. (769300.)

1948

448. Metropolitan-Vickers Electrical Co., Ltd., and Starling, P. P.—Ion generating apparatus. 6th January, 1949. (769292.)

1953

7711. Electric & Musical Industries, Ltd. —Electron discharge devices. 18th March, 1954. (769422.)

9575. Marconi's Wireless Telegraph Co., Ltd., and Buckingham, J.—Automatic frequency control systems. 6th July, 1954. (769542.)

16467. Marconi's Wireless Telegraph Co., Ltd., and Buckingham, J.—Electrical servo and feedback automatic control circuit arrangements. 20th May, 1954. (769543.)

19077. Philco Corporation.—Television apparatus. 9th July, 1953. (Addition to 750492.) (769486.)

21688. Electric & Musical Industries, Ltd. —Message selection in electrical communication or control systems. 26th July, 1954. (769305.)

22468. Valensi, G.—Colour television receivers. 14th August, 1953. (769306.)

23040. Hann, D. G.—Electrically heated glass furnaces. 18th August, 1954. (769428.)

28170. General Electric Co., Ltd.—Electrical computing apparatus. 6th October, 1954. (769431.)

29911. Rauland Corporation.—Cathode-ray tubes for the reproduction of images in colour. 29th October, 1953. (769432.)

29949. General Electric Co.—Electro-luminescent devices. 29th October, 1953. (769501.)

31846. Foster Transformers, Ltd., and Jennings, R. E.—A.c. arc welding systems. 15th November, 1954. (769433.)

34906. General Electric Co., Ltd., and Hubbold, S.—Switching arrangements for controlling a plurality of electric lamps. 9th March, 1955. (769436.)

1954

1329. Marconi's Wireless Telegraph Co., Ltd.—Television and like cathode-ray tube apparatus having magnetic screens. 14th October, 1954. (769401.)

2199. Metropolitan-Vickers Electrical Co., Ltd.—Electrical time division multiplex systems. 19th January, 1955. (769315.)

2404. Automatic Telephone & Electric Co., Ltd.—Electrical signalling systems. 13th January, 1955. (769402.)

5101. D.P. Battery Co., Ltd.—Plate grids of electric storage batteries. 7th February, 1955. (769404.)

5485. Truvox, Ltd.—Electric visual indicator devices. 24th February, 1955. (769203.)

6380. British Thomson-Houston Co., Ltd.—Metalclad switchgear. 2nd March, 1955. (769406.)

7012. Welwyn Electrical Laboratories, Ltd., Mace, P. C. D., and Williams, A. L.—Resistors. 13th May, 1955. (769407.)

7912. Stone & Co. (Deptford), Ltd., J.—Phase sequence discriminatory switchgear. 15th March, 1955. (769409.)

9302. General Electric Co., Ltd.—Electric incandescent filament lamps. 30th March, 1955. (769207.)

12345. Ultra Electric, Ltd.—Construction of submersible electric batteries. 24th February, 1955. (769413.)

13262. General Electric Co.—Protecting systems for electrical networks. 6th May, 1954. (769324.)

14567. General Electric Co., Ltd., and Thorne, A. R. H.—Cam operated electric switches. 18th May, 1955. (769213.)

16529. Prichard, L.—Heat control of electrically heated bodies. 31st May, 1955. (769214.)

17244. General Electric Co., Ltd., and Miller, J. S.—Cold cathode electric-discharge devices. 24th May, 1955. (769419.)

19803. Craig, F. E.—Three-phase discharge lamp lighting apparatus. 6th July, 1954. (769443.)

21263. Philips Electrical Industries, Ltd. —Transistor circuits. 21st July, 1954. (769445.)

23180. Signal-Stat Corporation.—Snap-action electric switches. 10th August, 1954. (769505.) 23181. Snap-action circuit-breaker. 10th August, 1954. (769506.)

24214. Sangamo Weston, Ltd.—Production of hermetically sealed joints in electrical plugs and like devices. 11th August, 1955. (769452.)

24502. General Electric Co., Ltd.—Glass-to-metal seals. 19th August, 1955. (769219.)

26453. British Thomson-Houston Co., Ltd.—Dry plate rectifier circuits. 26th August, 1955. (769507.)

27021. British Thomson-Houston Co., Ltd.—Vertical shaft alternators. 11th August, 1955. (769223.)

27145. Research Corporation.—Automatic voltage control of electrostatic precipitator with saturable reactor. 20th September, 1954. (769457.)

27189. Telephone Manufacturing Co., Ltd.—House automatic telephone exchange systems. 20th September, 1955. (769340.)

31952. General Electric Co.—Laminated core structures for electric induction apparatus. 4th November, 1954. (769461.)

32461. Siemens & Halske Akt.-Ges.—Railway track equipment including magnetically or inductively controlled railway track apparatus. 9th November, 1954. (769462.)

36649. Brentford Electric, Ltd.—Combined refrigerating and water heating systems. 13th May, 1955. (Addition to 767847.) (769230.)

1955

3750. Goldschmidt Akt.-Ges., T.—Electrically heated shaft furnace having an exchangeable insert. 8th February, 1955. (769471.)

4986. Siemens & Halske Akt.-Ges.—Electron tubes. 18th February, 1955. (769472.)

5096. Rauland Corporation.—Cathode-ray tubes. 21st February, 1955. (769356.)

5469. Busch-Jaeger Durener Metallwerke Akt.-Ges.—Plug and socket connectors for electric circuits. 23rd February, 1955. (769473.)

5570. Telefonaktiebolaget L. M. Ericsson.—Devices for indicating the presence of two pulses having a preselected time interval between them. 24th February, 1955. (769474.)

7229. International Marine Radio Co., Ltd.—Signal selector device. 11th March, 1955. (Addition to 765934.) (769479.)

8584. Fernseh Ges.—Electric motor control apparatus. 24th March, 1955. (769367.)

9452. Guen, F. Le.—Telephone signalling system employing low frequency a.c. 31st March, 1955. (769369.)

9512. Prince, D. C.—Current transformer. 1st April, 1955. (769245.)

10274. Landis & Gyr Akt.-Ges.—Brake magnet arrangement for use in electricity meters. 7th April, 1955. (769262.)

12523. Ogrey, A.—Coupling device for electrical connectors. 29th April, 1955. (769280.)

15400. General Electric Co.—Coil insulation for salient pole dynamo-electric machines. 27th May, 1955. (769399.)